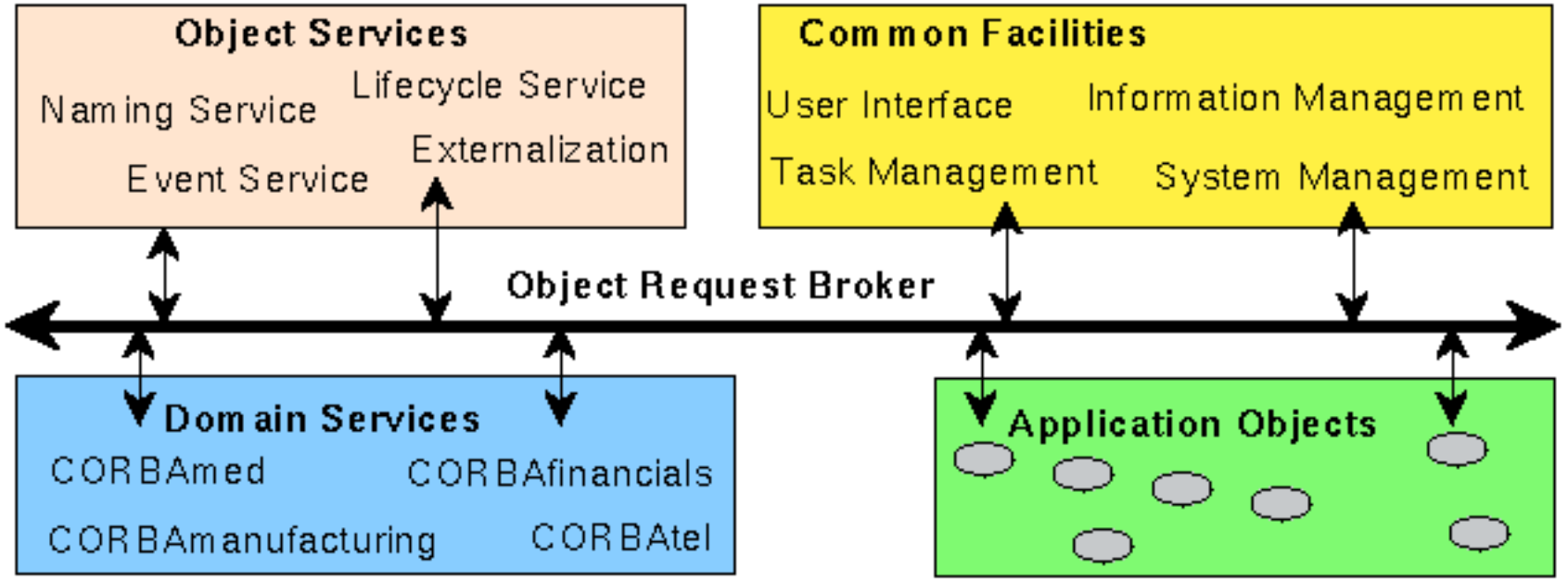
CORBA Services

The Object Management Architecture



Collection Service

- Grouping of objects
  - Sets, queues, sequences
  - Iterators for these collections
  - Factory classes for object creation
- `Collection` interface
  - `Set, Heap, Stack, Queue, SortedSet` are subclasses
- `Iterator` interface
  - `EqualityIterator, SequentialIterator` are subclasses
- `Operations` interface
  - Base class for operations on objects

Concurrency Service

- Framework for managing concurrent object access
  - Analogous to multithreading support in C++/Java
  - Facilities for interfacing with transaction service
- Concurrency Service assumes usage of locks
  - Read, write-locks, multi-possession, two-phase locks
  - Conflicts with existing locks are resolved by a first-come first-served queuing model
- Interfaces to represent resources:
  - `LockSet, TransactionalLockSet`
  - `LockSetFactory` interface for object creation

Event Service

- Flexible framework for asynchronous object interactions
  - DII provides basic form of asynchrony
  - Event Service targeted to *notification*, rather than *interaction*
- Event Service allows to set up event channels
- CORBA objects may act as
  - Event consumers
  - Event suppliers
- Push or pull event communication
- Interfaces:
  - `PushConsumer, PullConsumer, PushSupplier, PullSupplier, EventChannel`

Externalization Service

- Means for Object conversion
  - Allow export over general media (network streams, disk storage, etc.)
  - Constitute data back into object references (potentially in a different ORB / process)
- Pluggable data formats for externalized objects
  - Standard serialized format for objects is provided
  - Streaming model for externalizing and internalizing objects
- Interfaces:
  - `Stream`, `StreamFactory`, `FileStreamFactory`, etc;
  - Objects must extend `Streamable` interface
- Externalization Service uses Life Cycle Service

Licensing Service

- Controlled access to objects and services under a licensing model
  - Conceptually an extension of security service
- Operation
  - Client requests licensed service, proofs ownership of license
  - Service provider checks with license manager
  - Service provider may request notification on license expiration of may poll for changed in license state
- Interfaces
  - `LicenseServerManager, ProducerSpecificLicenseService`
- License Service depends on Security Service

Life Cycle Service

- Standard protocols for distributed objects:
  - Creation, copying, movement, deletion of remote objects
- Service defined around the concept of object factories
- Interfaces
  - `LifeCycleObject`,
  - `FactoryFinder` interface for locating object factories
- Life Cycle Service references Naming Service
  - When dealing with connected graphs of objects, the Relationship Service structures are referenced

Naming Service

- Most commonly used service in CORBA
  - Provides the principle way for clients to find objects on the network
  - Remote object references can be bound to names
  - Clients may access object references by providing the name
- A `NamingContext` represents a directory or subdirectory of named objects
  - This interface can be used to bind, lookup, or unbind objects and subcontexts within the naming directory
  - Names of objects within a `NamingContext` are composed of `NameComponent` arrays
  - Browsing can be done with a `BindingIterator`

Notification Service

- Extends asynchronous msg exchange of Event Service
  - Allows multiple event suppliers to send events to multiple event consumers
  - Supports pull and push models
  - Allows event channels to be federated
  - Allows clients to attach filters to each proxy in an event channel
- QoS properties:
  - Per-channel, per-proxy, per-event
- CORBA Notification Service uses:
  - `StructuredEvent, EventChannel, EventType` classes
  - `StructuredPushConsumer, StructuredPushSupplier` classes

Persistent Object Service

- Common framework to interact with persistency eng.:
  - Relational databases, object databases, etc.
  - Middleware between CORBA objects and database protocols (ODMG)
- Persistency…
  - Managed at object level or data member level
  - Objects typically control their own persistent state
- Interfaces:
  - `PO` (persistent object), `PID` (persistent object identifier), `POM` (persistent object manager)
- Persistent object service depends on:
  - Externalization Service, Life Cycle Service

Property Service

- Defines name/value pairs that can be assigned to objects
  - Without being explicitly defined by their IDL interfaces
  - Can represent any application-specific attributes
- Property Service does not specify how properties are associated with objects
  - Implementation detail
  - Properties are represnted as string name and an `Any` value
- Interfaces:
  - `PropertySet, PropertySetDef` (inquire metadata about properties - read/write, read-only, etc.)
  - `PropertiesIterator, PropertySetFactory`

Query Service

- General query mechanism for distributed objects
  - Collections of objects can be searched to generate subcollections
  - Subsets of objects within a collection can be deleted of updated
- Query Service's facilities can be mapped to persistent storage facilities
  - Relational databases, object databases
- Interfaces:
  - `Collection` objects (with an `Iterator`), `CollectionFactory`
  - `QueryManager, QueryEvaluator`
  - Result of a query typically is a `Collection` object

Relationship Service

- Allows for explicit specification of relationships among objects
  - Defined in terms of type, roles within the relationship, and the cardinality of each role
  - Objects fulfill a role when they participate in a relationship
  - Agent/proxy relationship: one agent, multiple proxies
- Interfaces:
  - `Relationship, Role`
  - `RelationshipFactory, RoleFactory, RelationshipIterator`
  - `CosGraphs, CosContainment, CosReference`

Security Service

- Provides the tools to secure distributed applications
  - Authentication, access control for users
  - Secure communication channels
- High-level security framework
  - Implementations are free to use any cryptographic framework
  - Layers security measures on top of ORB object-to-object model
- Interfaces:
  - `PrincipleAuthenticator, Credentials` object assigned to each user
  - `Current` object identifies security measures for current execution context
  - Extensions to the `org.omg.CORBA.Object` interface

Time Service

- Ability to enquire accurate time value + estimated error
  - Uses Universal Coordinated time representation
  - Time intervals of 100 nanoseconds since Oct 15, 1582
  - Times are relative to Greenwich Time Zone
- Time-based events, linear positioning of events
  - Implementation of time service is responsible for communication with accurate time source (Cesium clock, radio time broadcast, etc.)
- Interfaces:
  - `TimeService` object, `UTO` (Universal time objects)
  - `TimerEventT, TimerEventService, TimerEventHandler`
- Timer event portion depends on Event service

Trading Object Service

- Market trading context
  - Objects describe services offered to the system
  - Clients issue description of desired service
  - Trading service performs matching
- Interfaces:
  - `Lookup` interface to advertise needs of importers
  - `Register` interface to advertise properties of a service
  - `OfferIterator` to iterate through multiple offers (hits)
  - `Admin` interface to query for all outstanding offers and queries and to control matching process

Transaction Service

- Defines interfaces to allow distributed objects to create and engage in transactional interactions
- ACID properties
  - *Atomic* - any and all actions carried out as part of a transaction are committed of undone/cancelled
  - *Consistent* - actions within a transaction produce results that re consistent
  - *Isolated* - transactions do not see each other's effects until they are committed. If they are rolled back, their effects are not seen by other contexts
  - *Durable* - if a transaction completes successfully, its effects are made persistent

Transaction Service (contd.)

- Transaction can involve a series of remote method calls
  - Whole transaction is rolled back when a significant error is encountered
  - Transaction contexts are propagated along the way
- Service provides framework for notification and management of transaction boundaries
  - Little help with implementation of rollback operations
- Interfaces:
  - `Current` interface: start and end of transactions
  - `Control` interface: manipulation of ongoing transactions
  - `Terminator, Coordinator, Resource` objects
- Depends on Concurrency and Persistent Object Services