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TIBCO StreamBase 10
Runtime Concepts and Definitions

November 2017

TIBCO StreamBase 10 Runtime Concepts and Definitions Agenda

1. Definitions
2. Conceptual Model
3. Physical Model
4. Services and Administration
5. Node States and Actions
6. Design Time to Deploy Time
7. Capabilities

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StreamBase 10 Runtime Concepts

Definitions and Models

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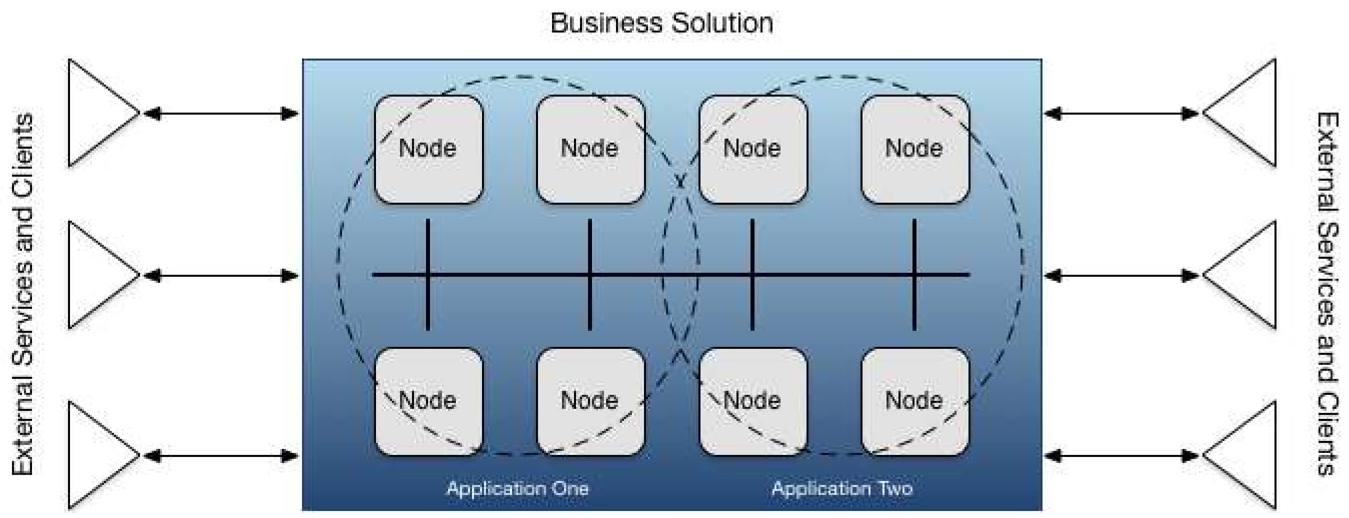
Business Solution



- A business solution: One or more applications deployed on some number of nodes

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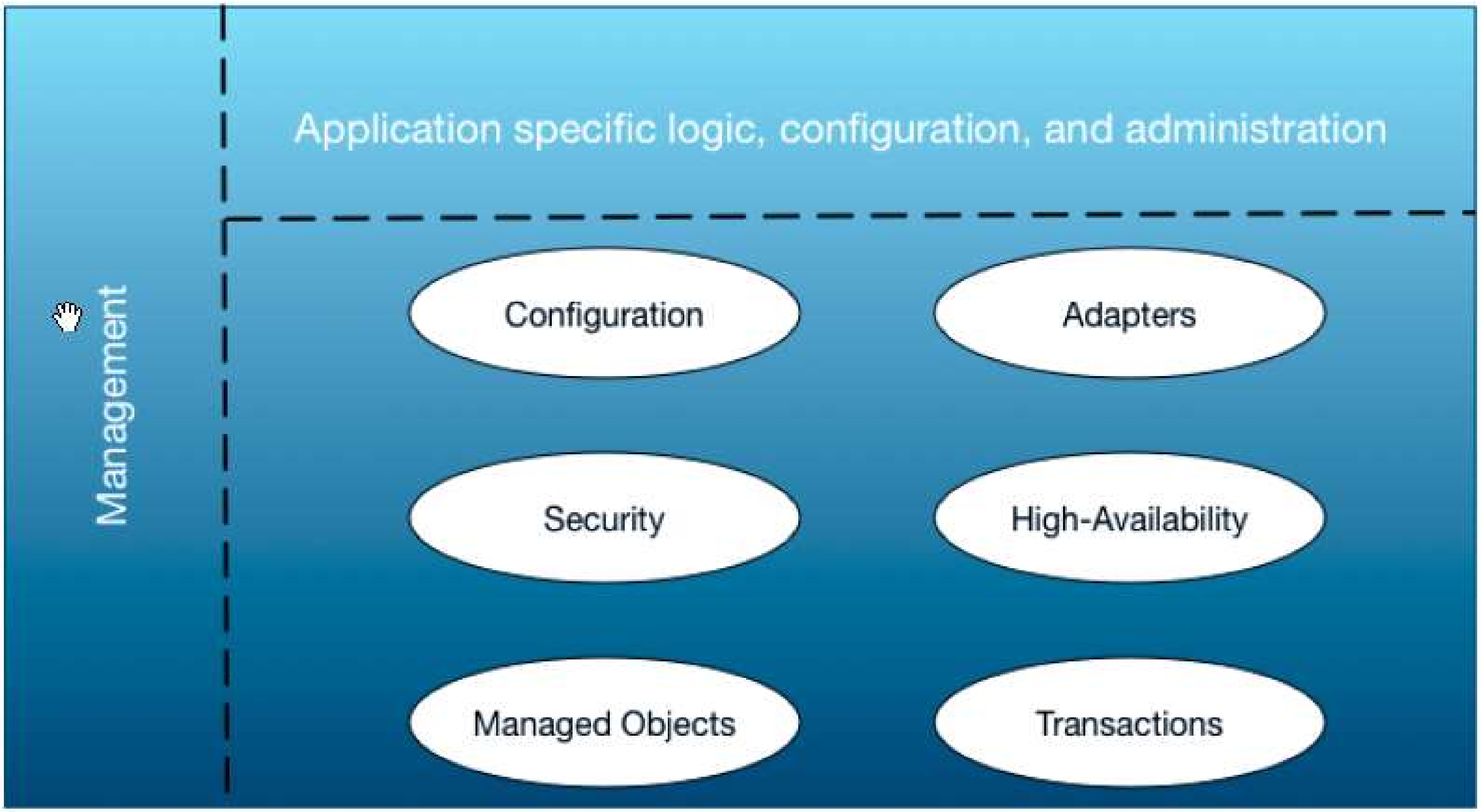
Runtime Platform Services



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BACKGROUND: What is an *Application* in StreamBase 7?

- A single .sbapp file – smallest unit possible
- Also called a module – unit of composition on application side
- A StreamBase container's worth: a top-level module and all the (sub-)modules and resources it references
- A business application: whatever definition given by user, the logical application that provides meaningful value

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What is an *Application* in the StreamBase 10 Runtime?

- Consists of one or more application fragments
- Fragment, config files, dependencies packaged into an app archive
- There are different types of application fragment types
- An application can mix fragment types
- An application forms part of a business solution

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Applications are . . .

- **Distributed:** applications are transparently distributed across various machines
- **Highly available:** if one machine fails, processing of in-flight and new transactions can continue uninterrupted on another machine
- **Elastic:** machines can be added or removed as needed based on the current load
- **Extensible:** applications can be upgraded with changed, or entirely new, behavior without a service outage
- **Configurable:** applications are highly configurable with configuration changes occurring without interrupting in-progress work
- **Geographically redundant:** applications can be deployed across wide-area networks to support disaster recovery
- **Discoverable:** applications are discoverable using a discovery service to eliminate any dependency on actual machine network addresses

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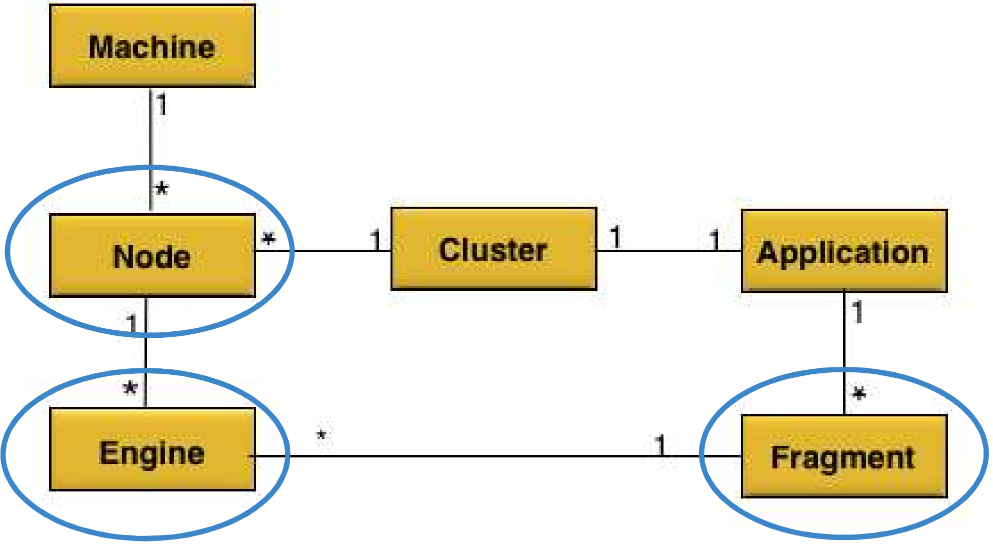
Conceptual Model Definitions

- A **fragment** is an executable part of an application.
  - A fragment is executed on one or more engines.
  - A single EventFlow fragment may contain multiple StreamBase containers.
- An **engine** is an execution context for a fragment.
  - StreamBase fragments run in the context of a StreamBase engine (single JVM).
- A **node** is a container for one or more engines.
  - A node can belong to one cluster.
  - A node can host one or more engines.



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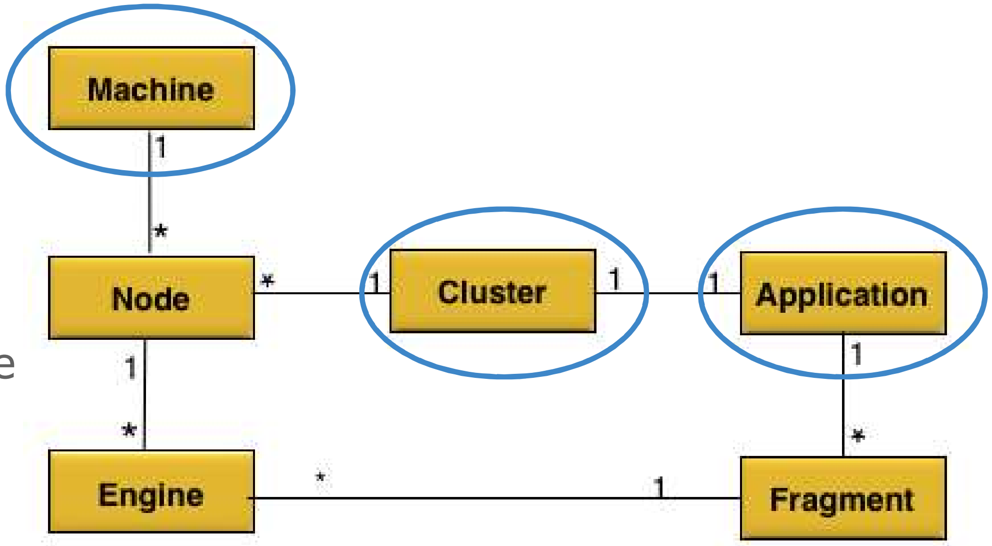
Conceptual Model Definitions

- A **machine** is a physical or virtual computer that provides an execution context for a node.
  - One or more nodes can run on a single machine.
- A **cluster** is a logical grouping of one or more nodes that communicate to support an application.
  - One cluster hosts a single application.



- An **application** is a program that provides organization-specific functionality, potentially on a large scale.
  - An application is run on one or more nodes.
  - An application contains one or more fragments.

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Conceptual Model Summary

- An application is executed on one or more nodes.
- An application contains one or more fragments.
- A fragment is executed on one or more engines.
- One or more nodes can run on a single machine.
- A node can belong to one cluster.
- A cluster can host a single application.
- A node can host one or more engines.

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StreamBase Containers in StreamBase 10

- StreamBase Container != Docker Container
- An EventFlow fragment may create multiple StreamBase containers (and may create inter-container connections)
- StreamBase containers are fully supported at design-time
- Adding StreamBase containers at runtime is discouraged since it doesn’t follow the StreamBase 10 application and deployment model designed to support cloud and DevOps deployment models
- Runtime deployment of new application logic should be done by starting a new node with the updated application (cloud model)

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Physical Model: Concepts Mapped to Physical Entities

1. Fragment

   a fragment archive generated at design-time containing executable application code

2. Engine

   operating system process (JVM) executing one (and only one) fragment managed by node coordinator

3. Node

   set of operating system processes running on a machine – monitored and managed by a node coordinator process

4. Machine

   physical or virtual computer

5. Cluster

   collection of nodes interconnected by a network

6. Application

   an application archive generated at design-time containing with 1 or more fragments

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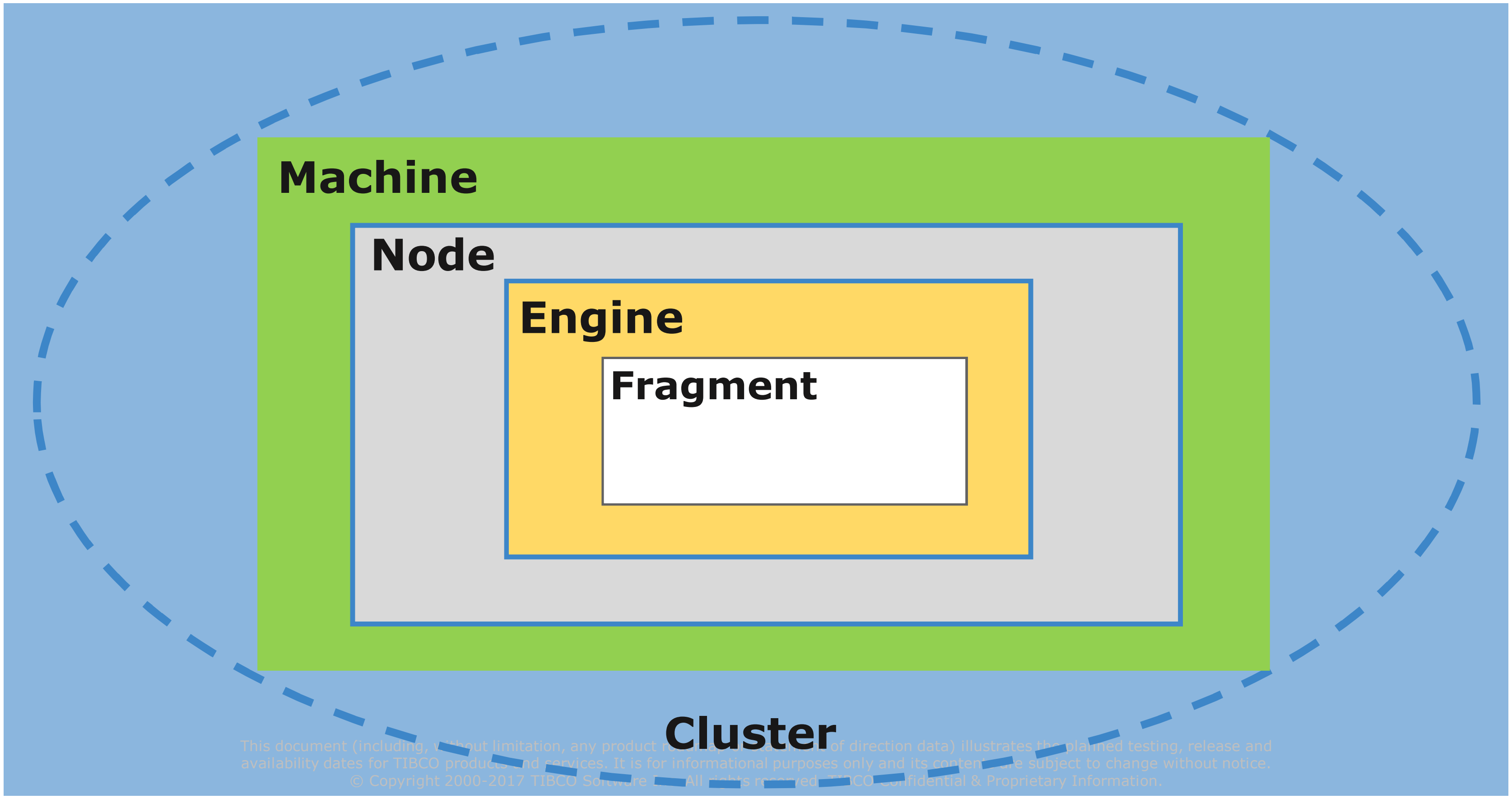
Runtime Layers



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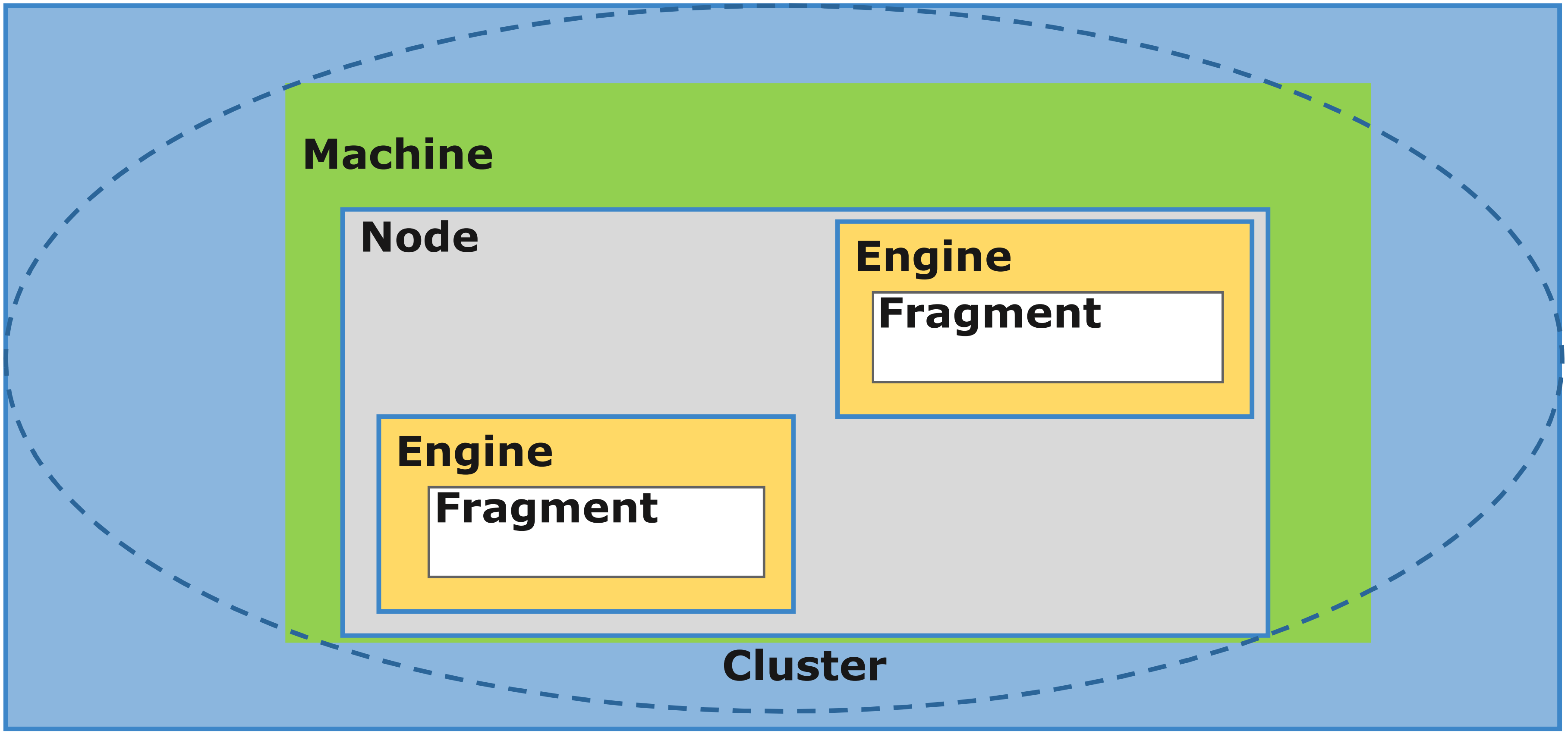
Setup: Cluster with One Machine, One Node, **Two** Engines



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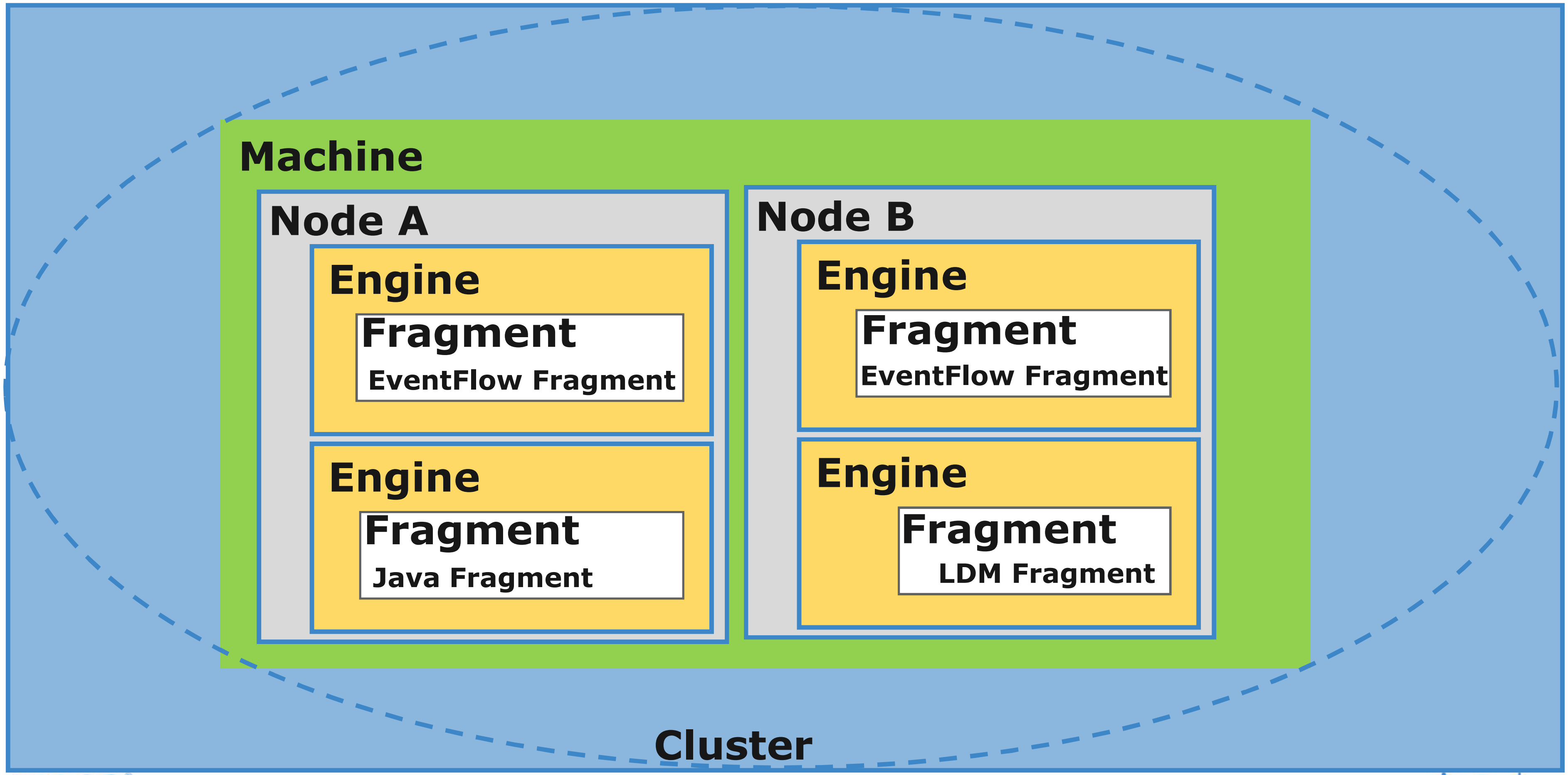
Setup: Cluster with One Machine, **Two** Nodes, **Two** Engines Each



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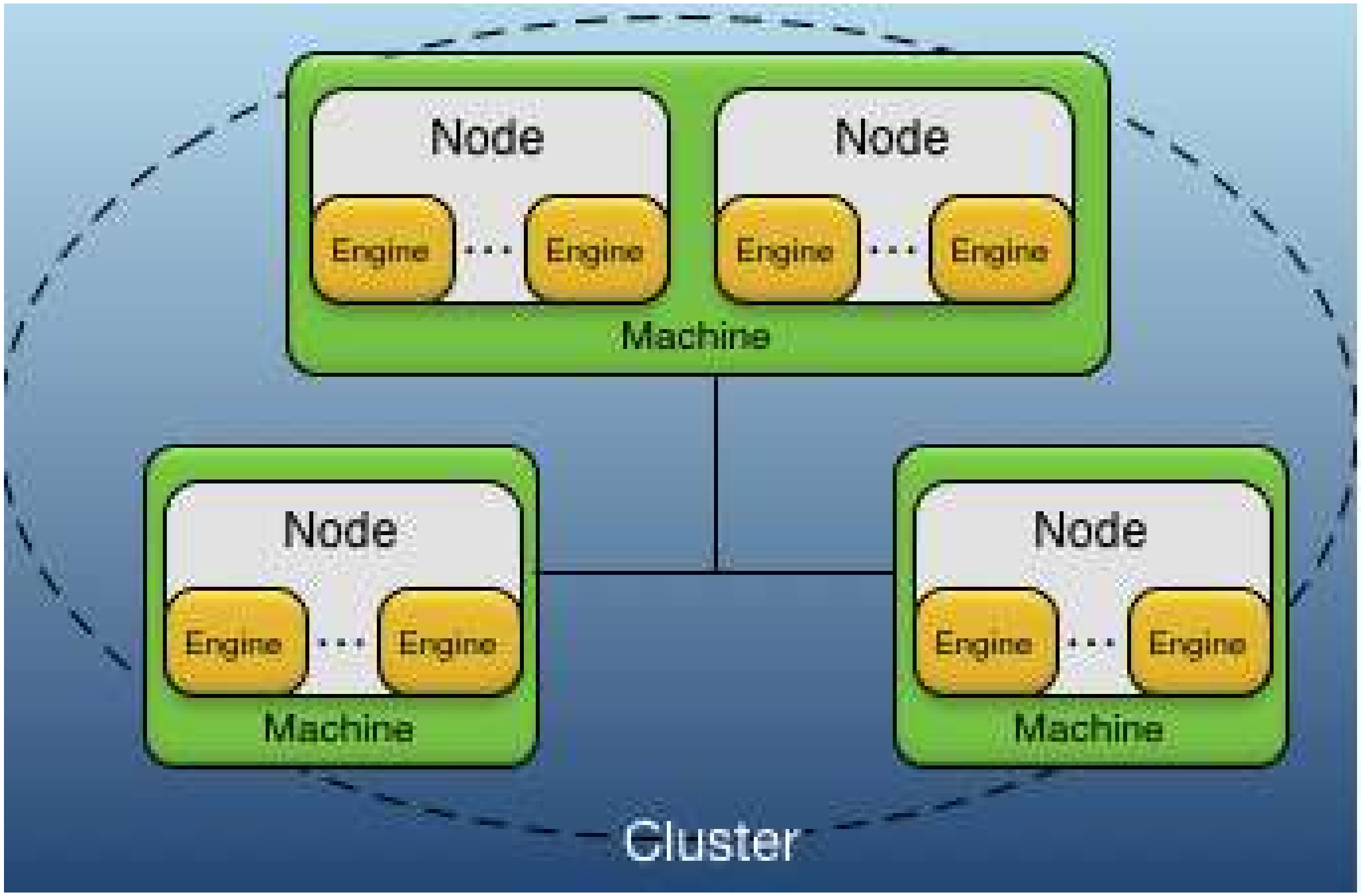
Clusters, Nodes, Engines



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StreamBase 10 Runtime Concepts

Services and Administration

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Service names

- Nodes uniquely identified by *service names*
- Service names are hierarchical and have:
  - Node name
  - Optional grouping name(s)
  - Cluster name
- Examples
  - A.X // node A in cluster X
  - B.ny.east.X // node B with two groups ny and east in cluster X
  - .west.X // all the nodes in the west group of cluster X
- Used by the *discovery service* to locate network information
- Use instead of network address when accessing nodes

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Discovery Service

- Network-address independent discover of node details
- Multiple *service records* per node
- One service record for each *service type*
- Service types have multiple *service properties*
- Used by nodes and StreamBase Runtime clients
  - epadmin, Runtime Java API
  - As of StreamBase 10.1, the StreamBase*Client and LiveView*Client APIs do not use Runtime service discovery: they still use sb:// and lv:// URIs, respectively. Service name resolution for these APIs is a roadmap item

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Service types and properties

- node: name, network address, state, app version, app name, container
- cluster: name
- http: name, network address
- distribution: name, network address, location code
- Application: name, network address, description, cluster

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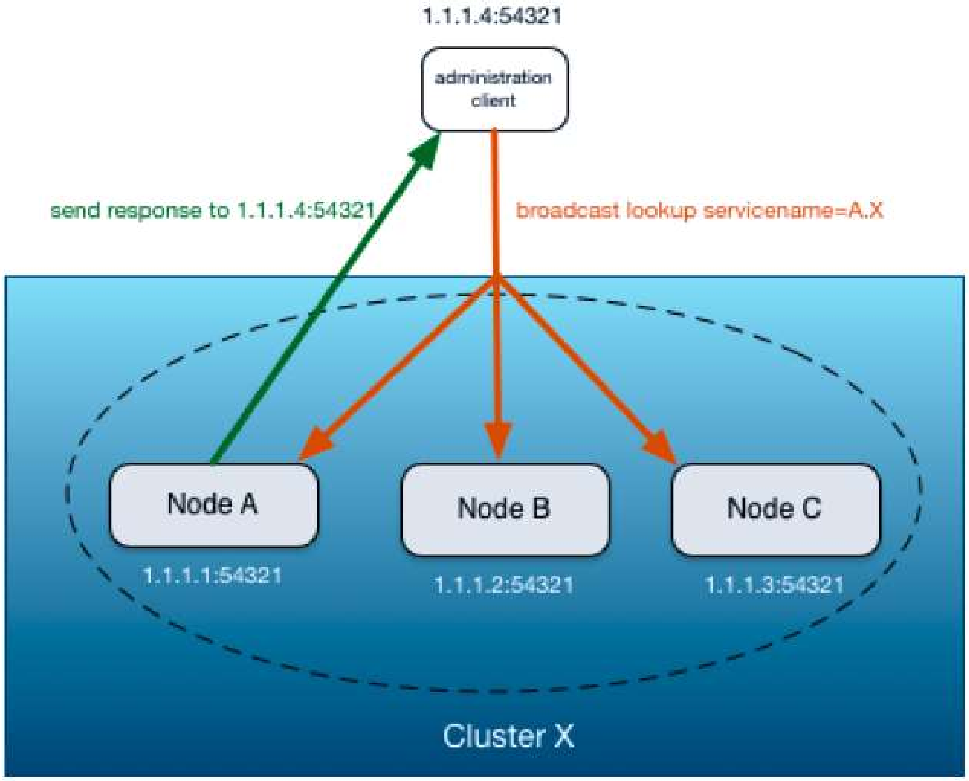
Service Discovery

- Uses UDP broadcast by default
- Specified broadcast port
- Uses network interface that matches hostname or specified
- FQN gets uses first response
- PQN waits for multiple responses



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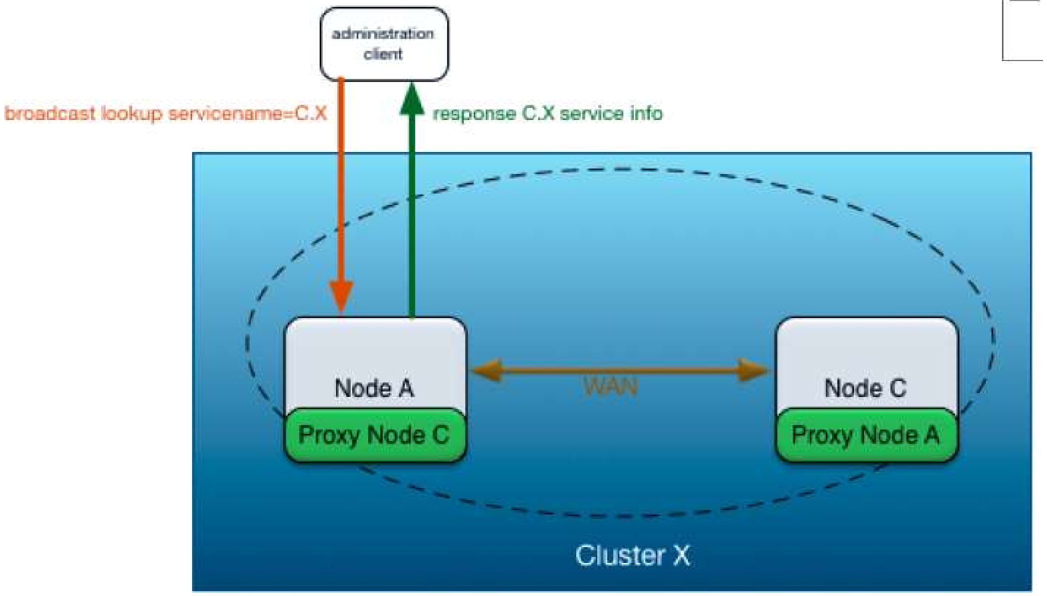
Proxy Discovery

- UDP broadcast not always best choice or available (WAN/cloud)
- Nodes can be designated as discovery proxies for a cluster



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Managing Nodes

- Service name or administration address
- Partially qualified service names may operate on multiple nodes at once
- Management clients
  - epadmin command line
  - JMX

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Cluster Lifecycle

- Name established when node installs
- Dynamically created and destroyed when first node started and last node removed
- Application is active so long as the cluster is active

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StreamBase 10 Runtime Concepts

Node States and Actions

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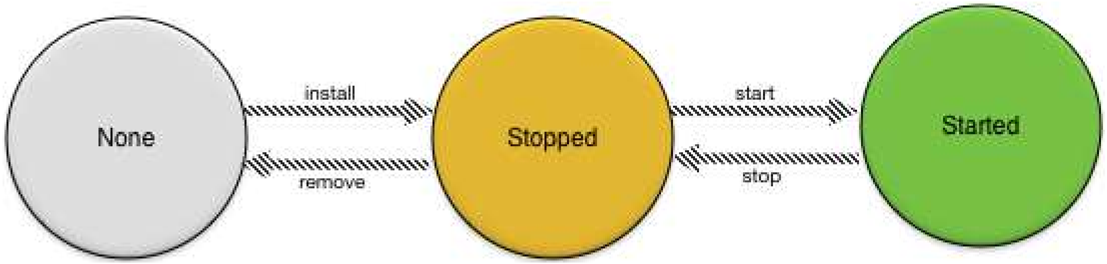
Node States and Actions

1. install
2. start
3. stop
4. remove



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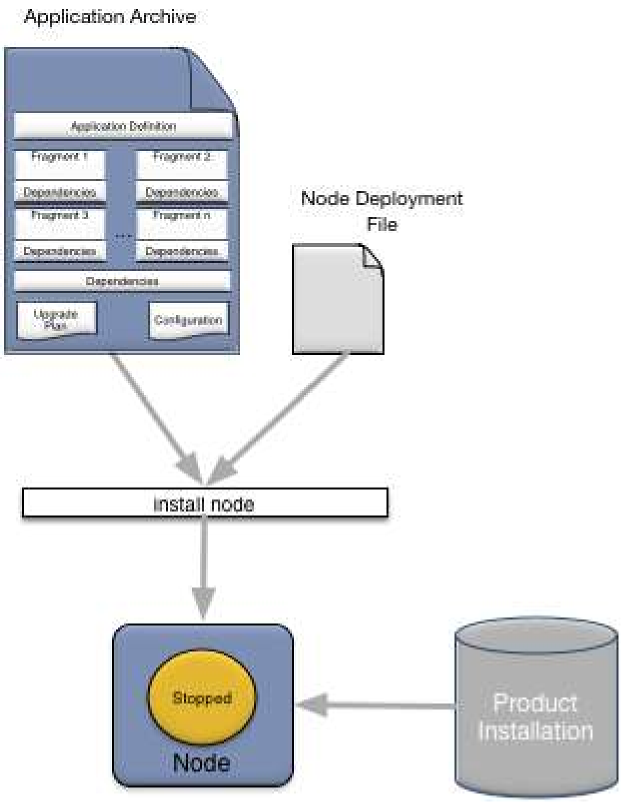
Installing Nodes

- After a node is successfully installed, the following has occurred:
  - application container services have been started.
  - the administration services have been started.
  - the application archive has been installed into the node directory.
  - the default application configuration and the node deploy configuration have been processed.
  - all application fragment engines have been installed.
  - the node is in the **Stopped** state.
- The node can now be started



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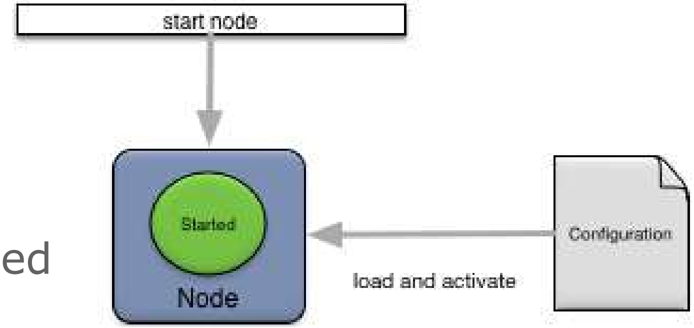
Starting Nodes

1. Starting a node is done using an administrative client
2. Once Started
   - Config files are loaded and activated
   - All application fragment engines are started
   - Node joins the cluster
   - Node transitions to the started state



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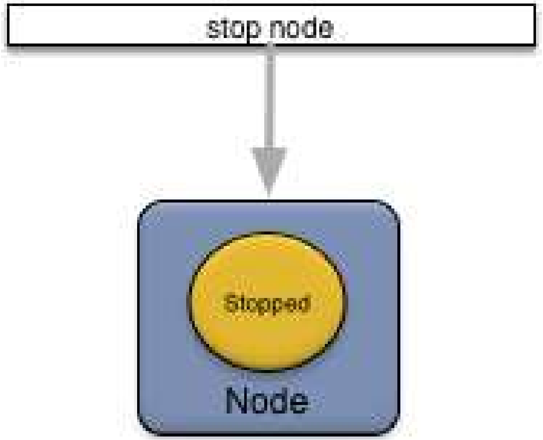
Stopping Nodes

1. Configuration files are deactivated and unloaded
2. All application fragment engines are stopped
3. Node leaves the cluster
4. Node transitions to the stopped state



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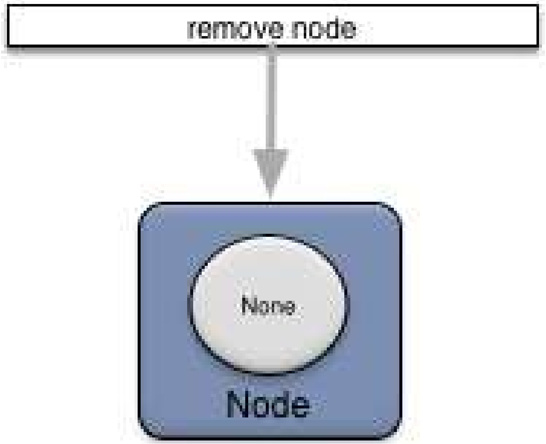
Removing Nodes

1. All application container services are stopped
2. Administration services are stopped
3. All application fragment engines are removed
4. Node directory is removed



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StreamBase 10 Runtime

Design Time to Deployment Time

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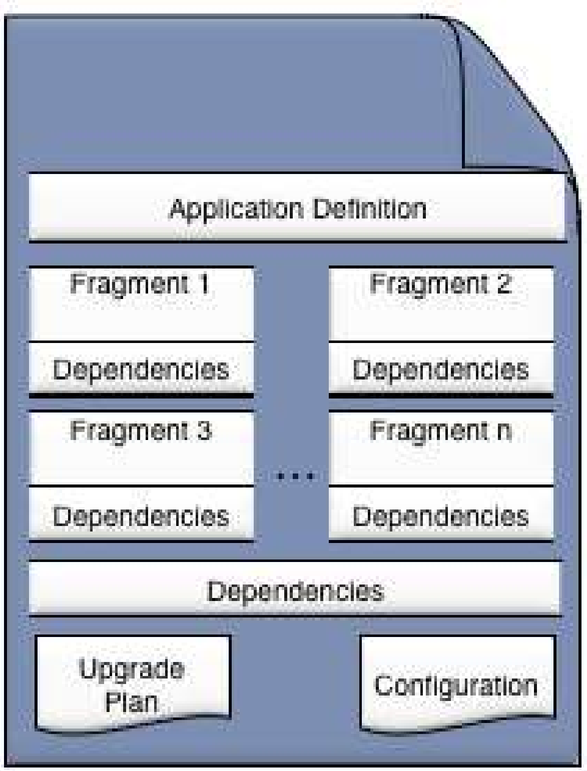
Application Archives - Design Time

- An application definition
- One or more fragments
- Optional dependencies (3rd party jars/libs)
- Optional default configuration
- Does NOT contain: deployment time details (no network topology information



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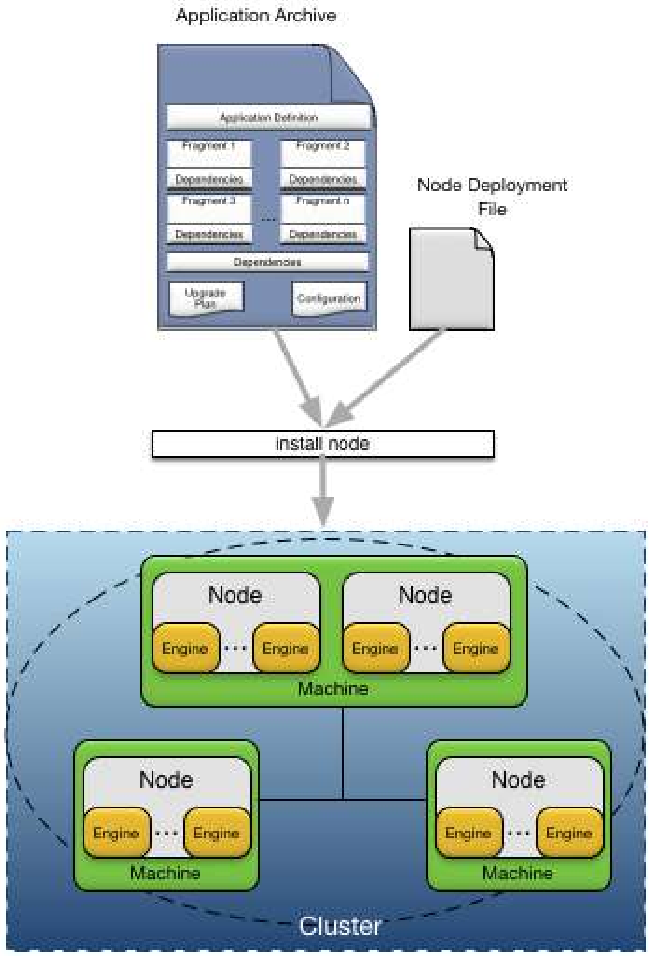
Application Archives – Deploy Time

- Given an application archive (from design time)
- Optional node deploy configuration



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Node Processes: processes started when a node is running

- These processes are running after a node is started and no application fragments are running. The names here are displayed using ps
- **swcoord** - node coordinator process. Starts and monitors all other node processes and hosts the administration port
- **System::swcoordadmin** - node coordinator administration IPC service. Provides an IPC mechanism between the node coordinator process and the rest of the processes on a node for administration commands
- **System::kssl** - node local authentication and authorization service. Provides all access control for node administration services
- **System::administration** - node administration. Provides node administration commands
- **Node::distribution** - node distribution service. Provides node-to-node distribution services
- These processes will change over time as we refine and change the node level services
- There is an additional process started for each engine running on a node hosting a fragment. They currently have a name that looks like **application::<engine-name>**, for example **application::Dtm_sbapp0**

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StreamBase 10 Runtime Capabilities

Entities in StreamBase now have these capabilities

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Properties of Managed Objects

1. Transactions
2. Distribution
3. Durable Object Store
4. Keys and Queries
5. Asynchronous methods
6. High Availability

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