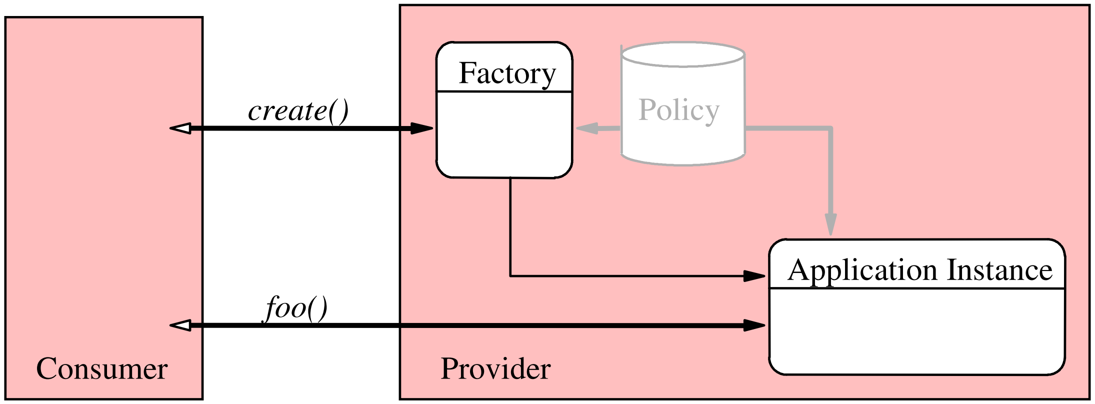
WS-Agreement Protocol Overview

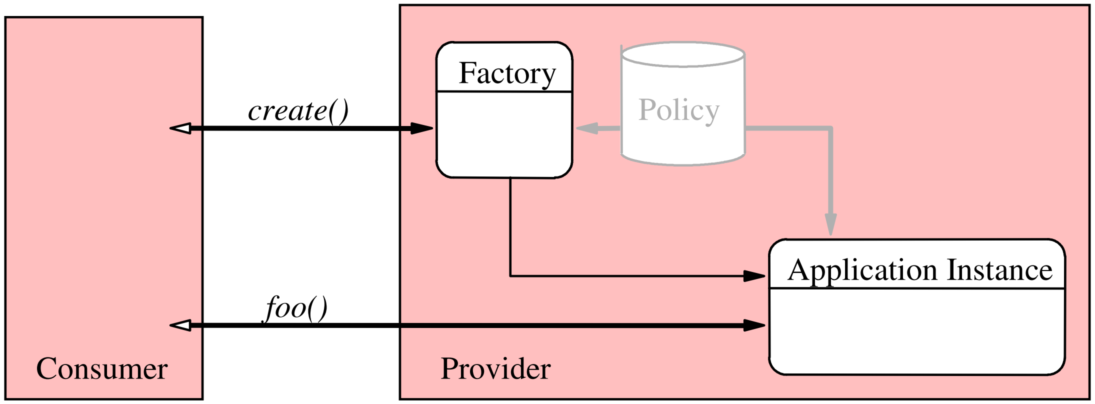
Karl Czajkowski

Layered Architecture (1/3)



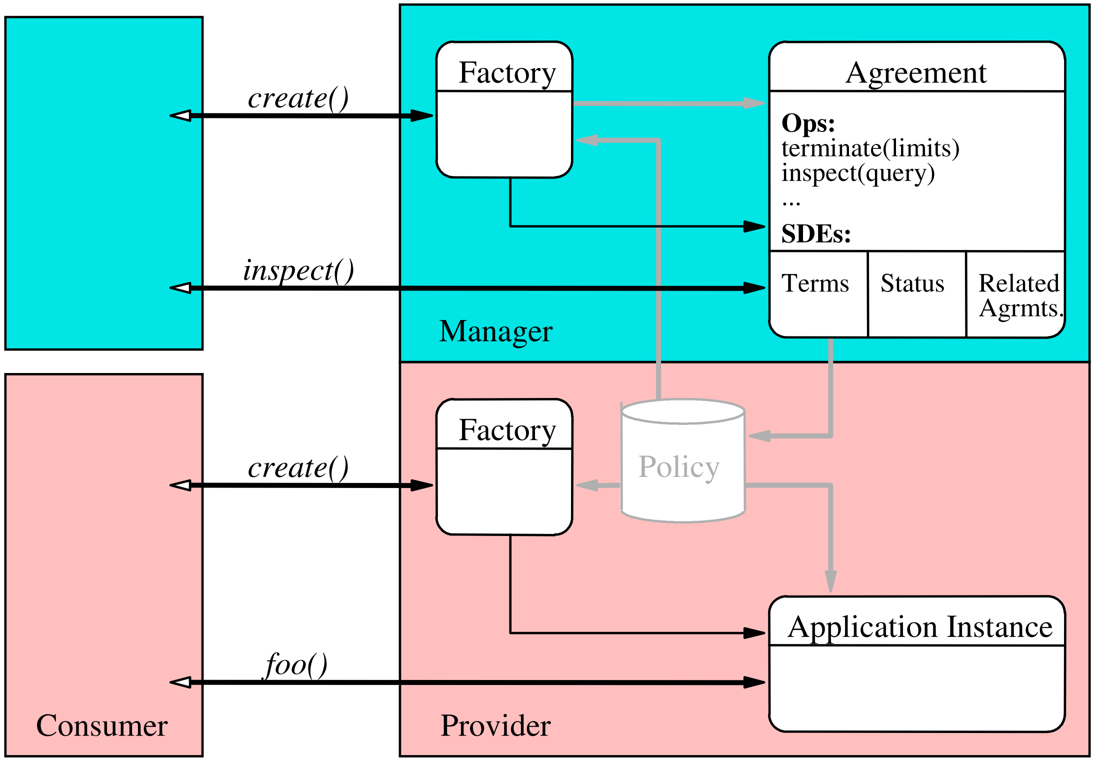
- Service Layer
  - Domain-specific
  - Factories
  - Instance states
  - Hosted by provider

Layered Architecture (2/3)



- Service Layer
  - Policy
    - Part of provider
    - Affects complex service behavior
  - Domain-specific
  - Factories
  - Instance states
  - Hosted by provider

Layered Architecture (3/3)



- Agreement Layer
  - Externalized policy
  - For managing service providers
  - Federation
- Service Layer
  - Policy
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    - Affects complex service behavior
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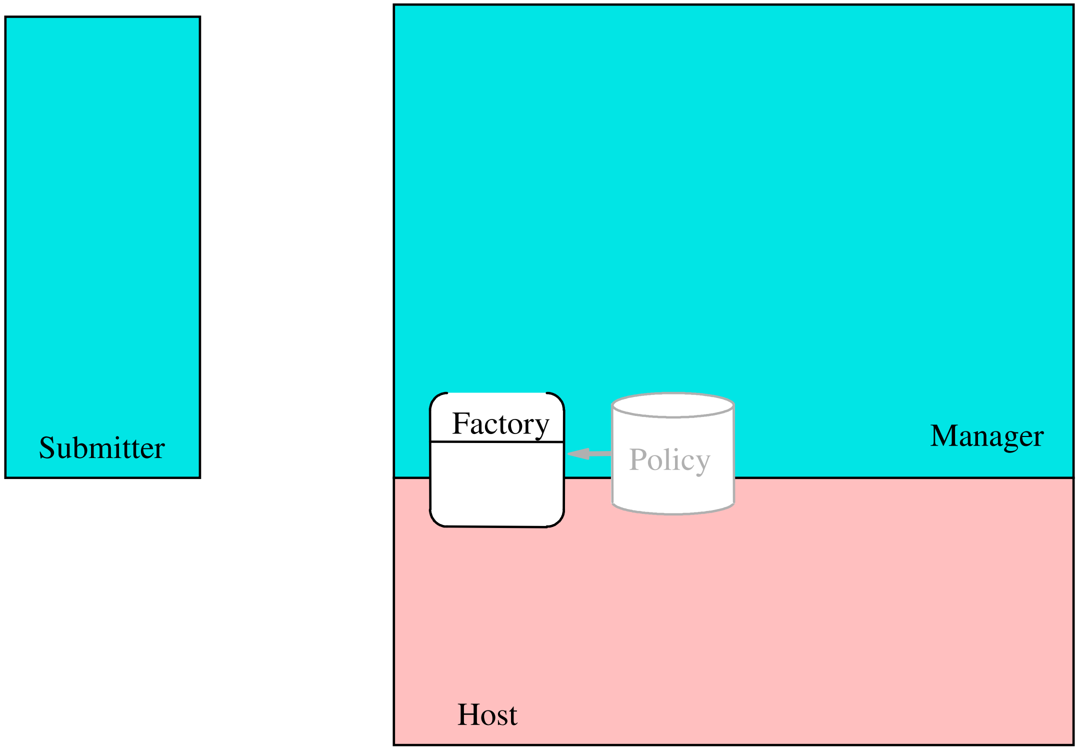
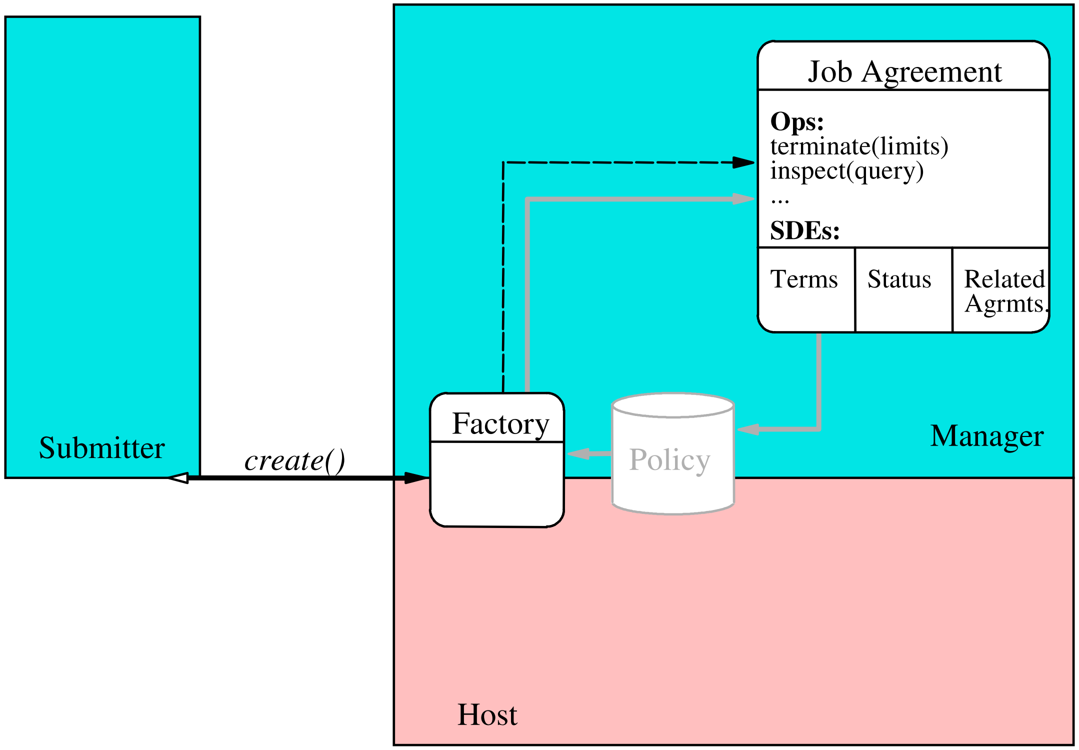
Simple Job Example (1/4)

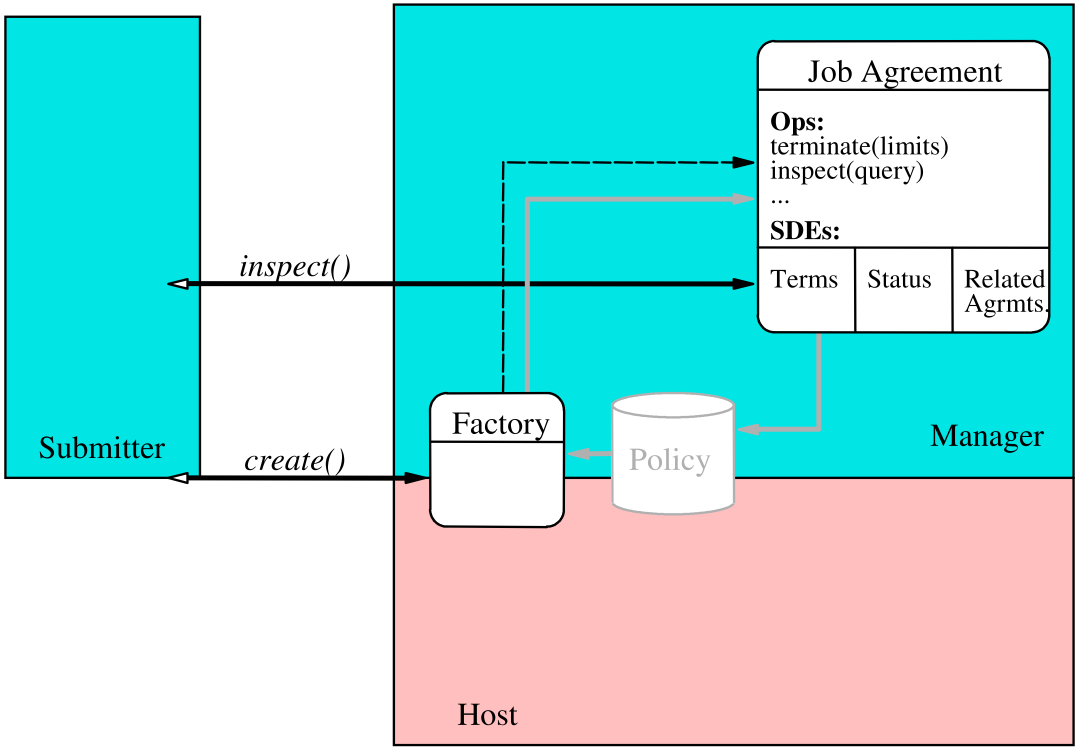


Simple Job Example (2/4)



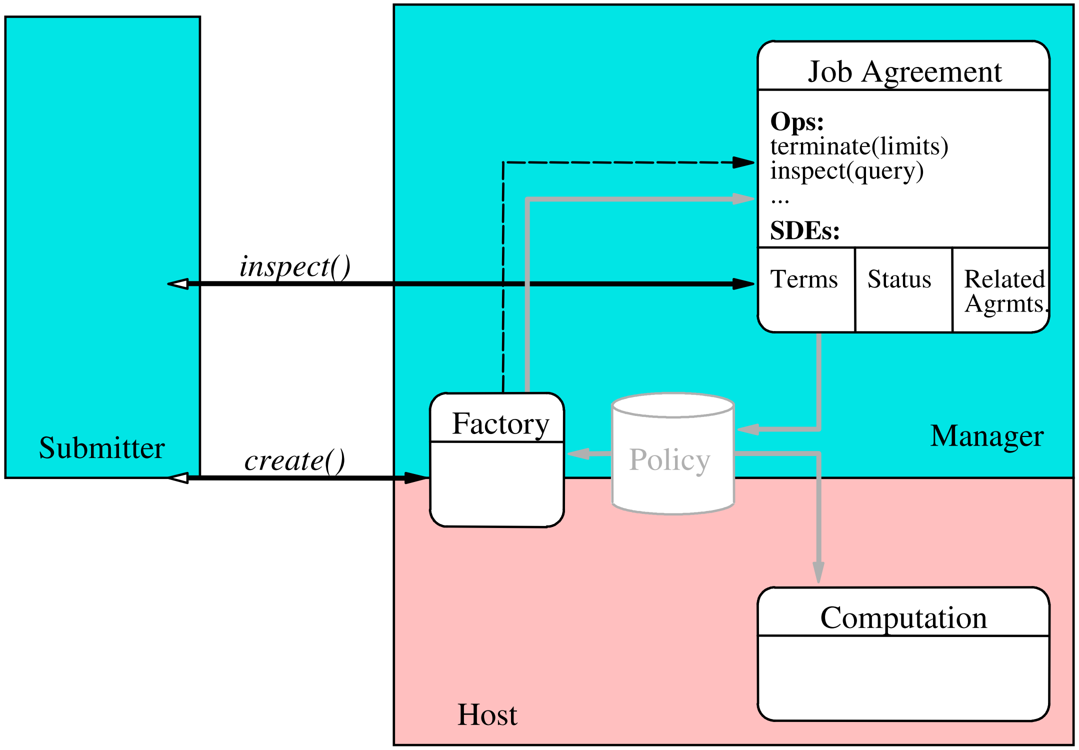
- Submitter calls create
  - Job Agreement

Simple Job Example (3/4)



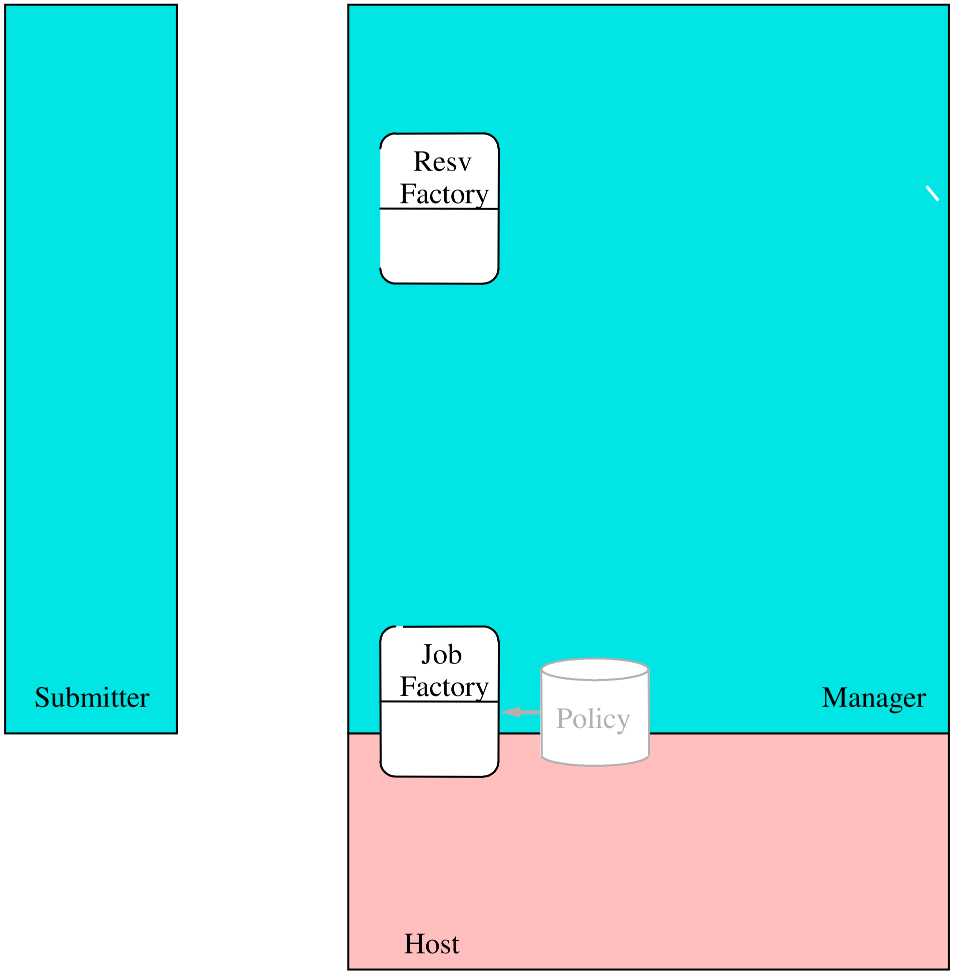
- Submitter calls create
  - Job Agreement
- Inspection and monitoring
  - Job states

Simple Job Example (4/4)

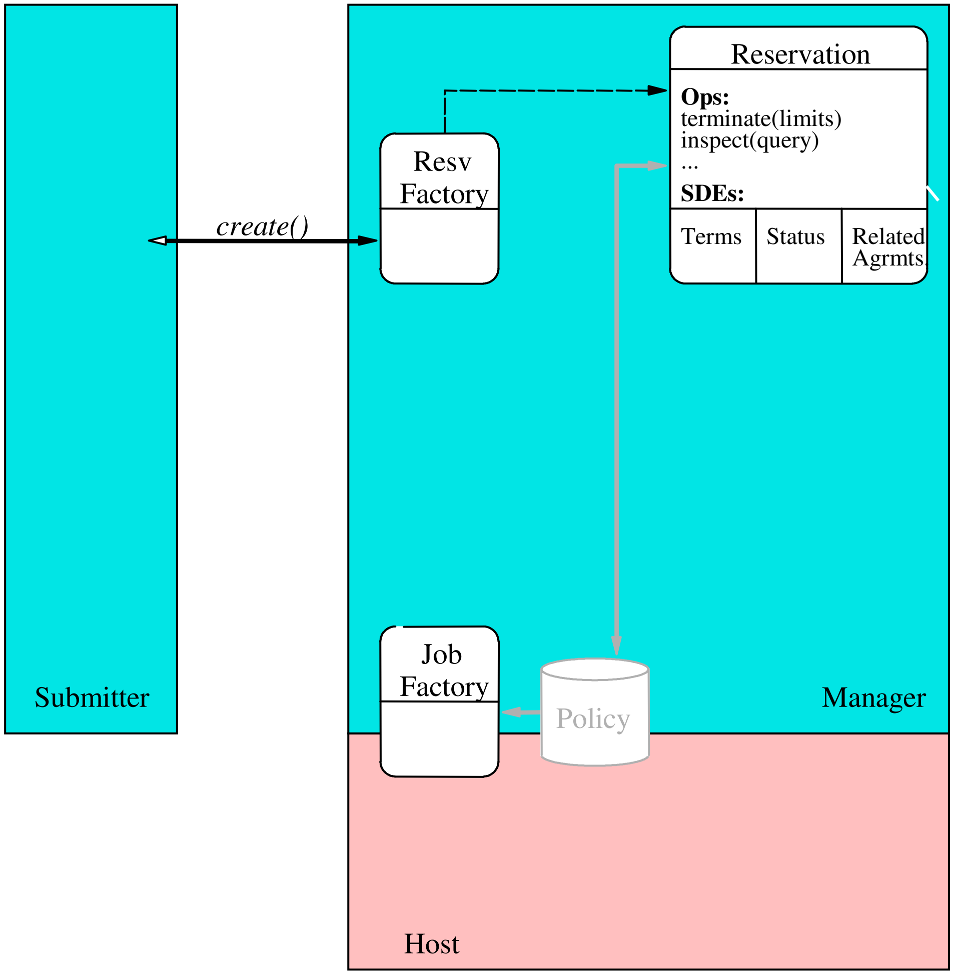


- Submitter calls create
  - Job Agreement
- Inspection and monitoring
  - Job states
- Execution
  - As scheduled

Advance Reservation (1/4)

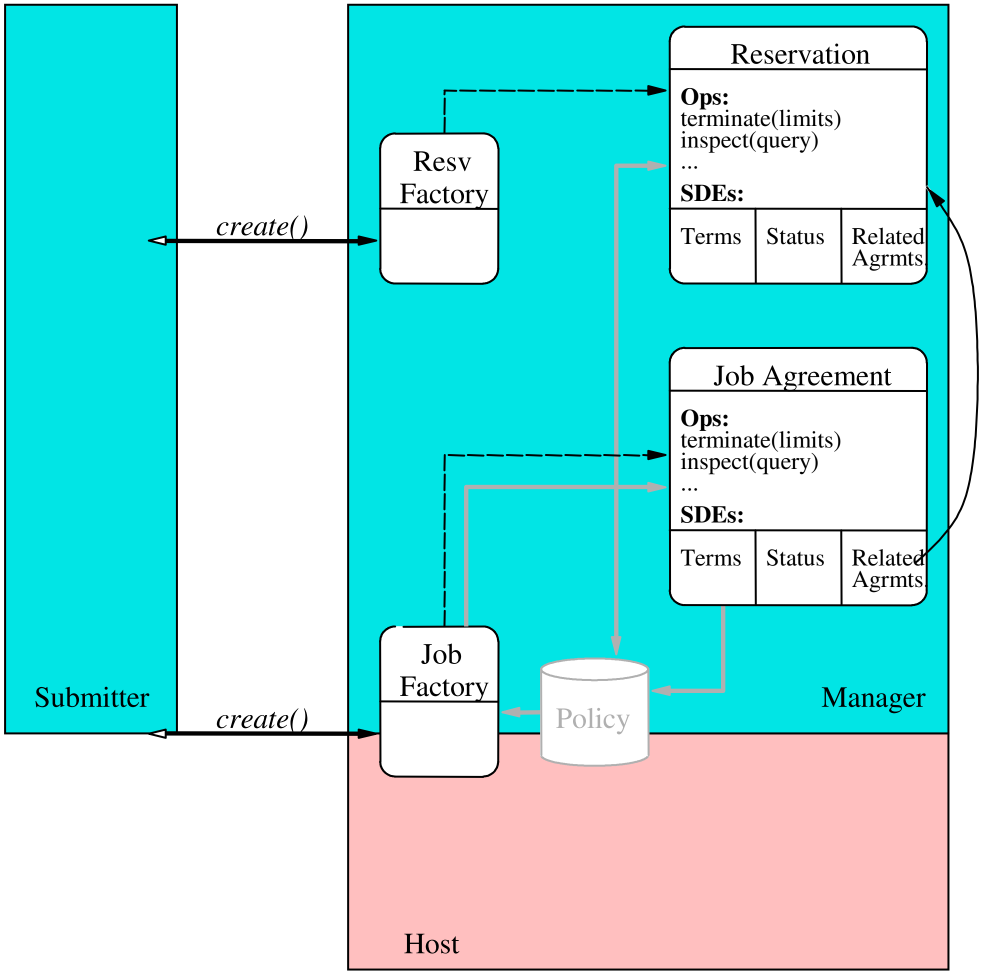


Advance Reservation (2/4)



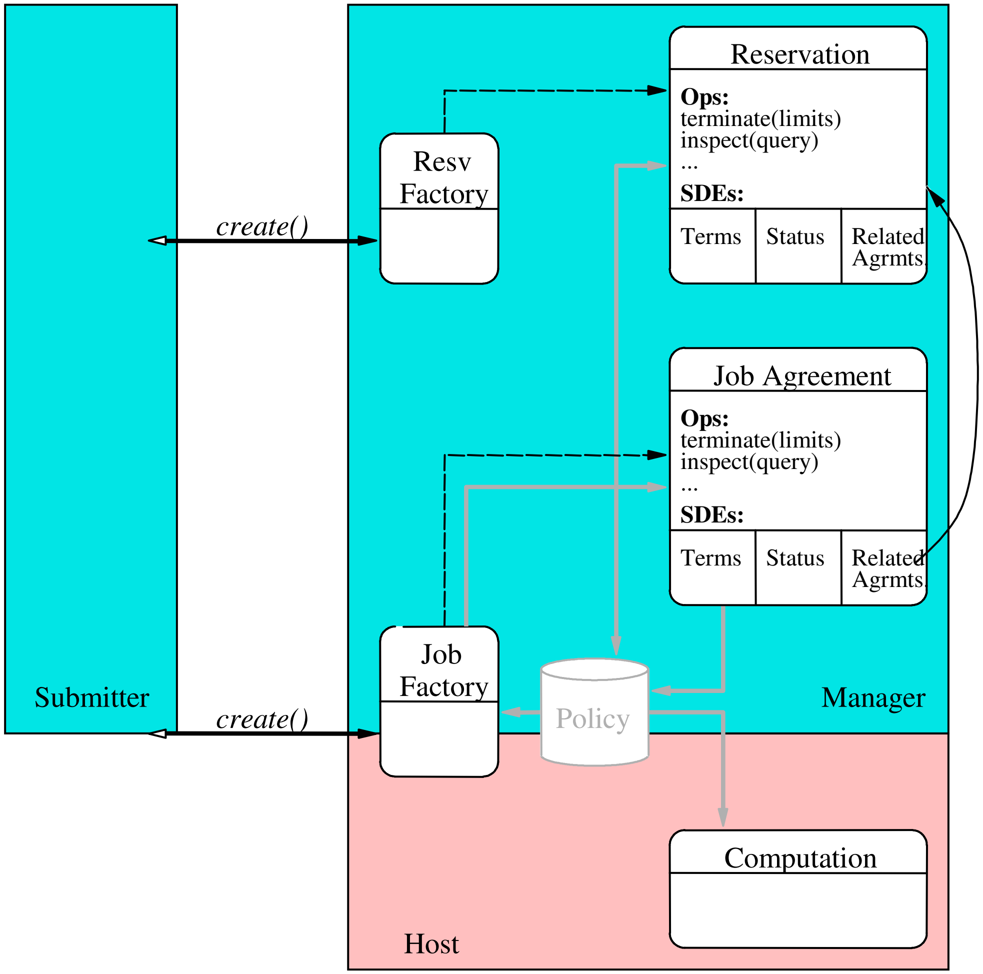
- Submitter create
  - Advance resv.
    - Schedule
    - Resource reqs.

Advance Reservation (3/4)



- Submitter create
  - Advance resv.
    - Schedule
    - Resource reqs.
- Submitter create
  - Job
    - Program details
    - Reference resv.

Advance Reservation (4/4)



- Submitter create
  - Advance resv.
    - Schedule
    - Resource reqs.
- Submitter create
  - Job
    - Program details
    - Reference resv.
- Execution
  - As per agreements

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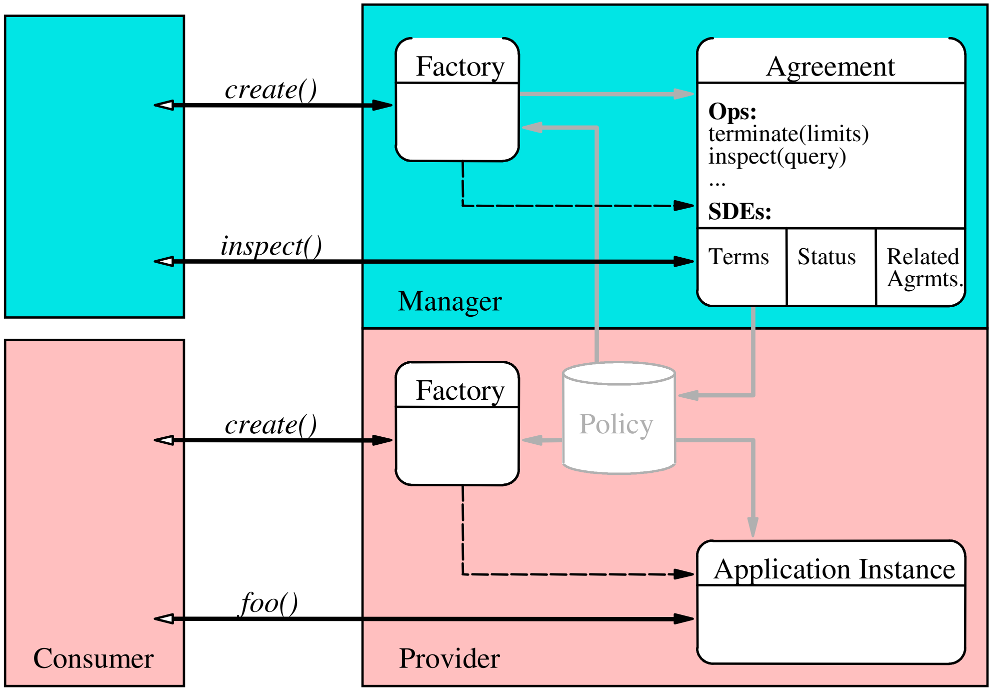
Adding Negotiation (1/2)



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- Service Layer
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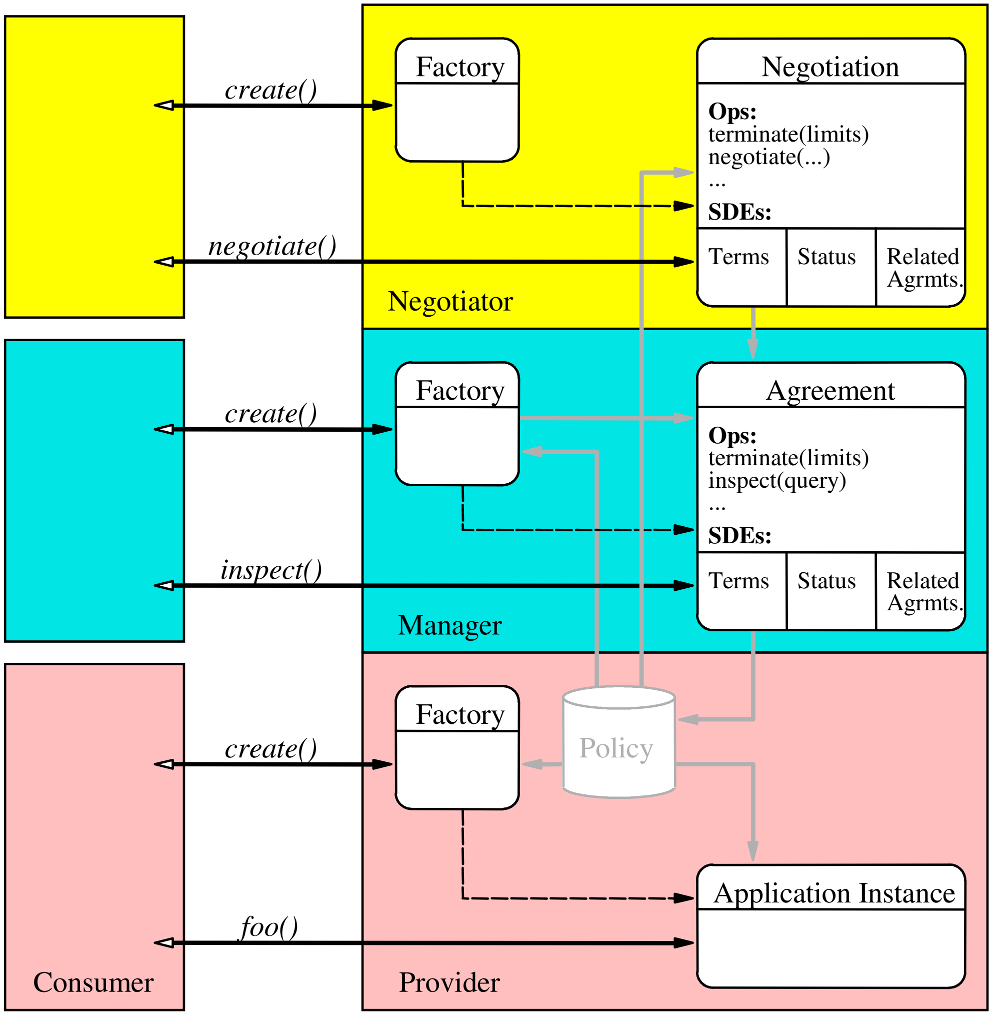
Adding Negotiation (2/2)



- Negotiation Layer
  - For managing Agreements
  - Complex dialogues
  - Coordination
- Agreement Layer
  - Externalized policy
  - For managing service providers
  - Federation
- Service Layer
  - Policy
    - Affects service
  - Domain-specific

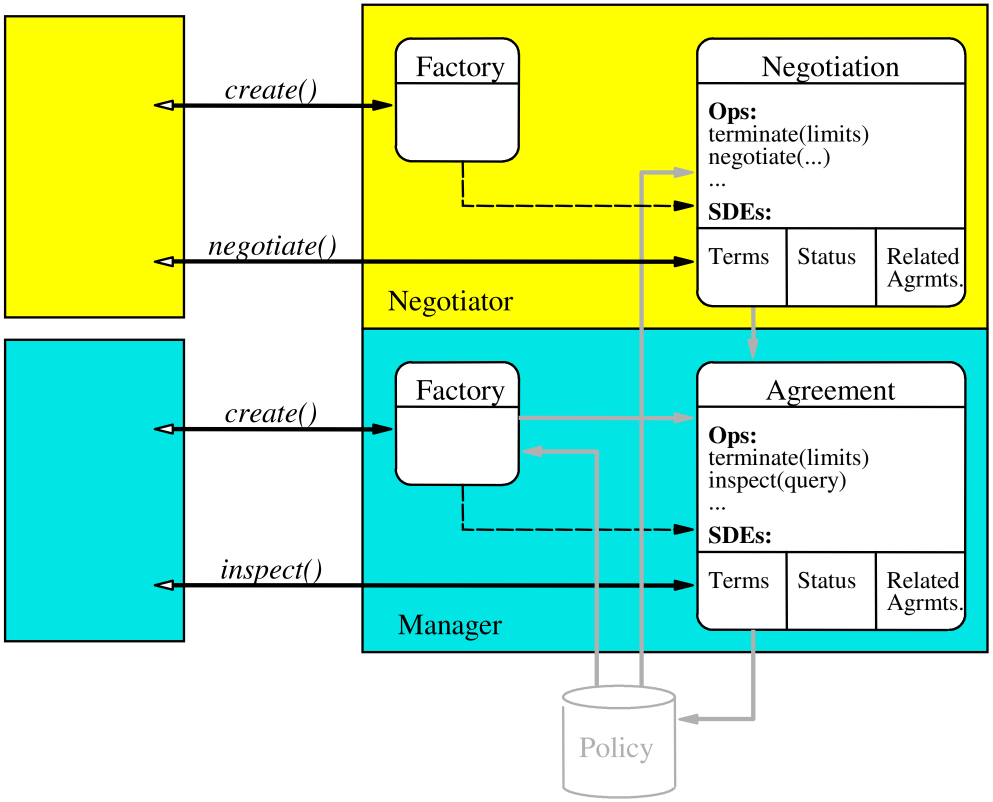
WS-Agreement in one Slide

- *Services* are domain-specific interactions between providers and consumers.
- *Agreement* characterizes the obligations of the providers and consumers:
  - A “contract” of expected performance, lifetime, preconditions, and payment *terms*.
  - Agreements only matter when *observed*.
- *Negotiation* is an optional dialogue to establish an Agreement.

Negotiation is Optional

- The process of establishing an Agreement is *negotiation*.
  - Simple Agreement factory
  - Our Negotiation model
  - 3rd party negotiation model
- Our proposed negotiation model is optional
  - We use it as a proper noun: *Negotiation* or *wsag:Negotiation*

Implicit Service Models

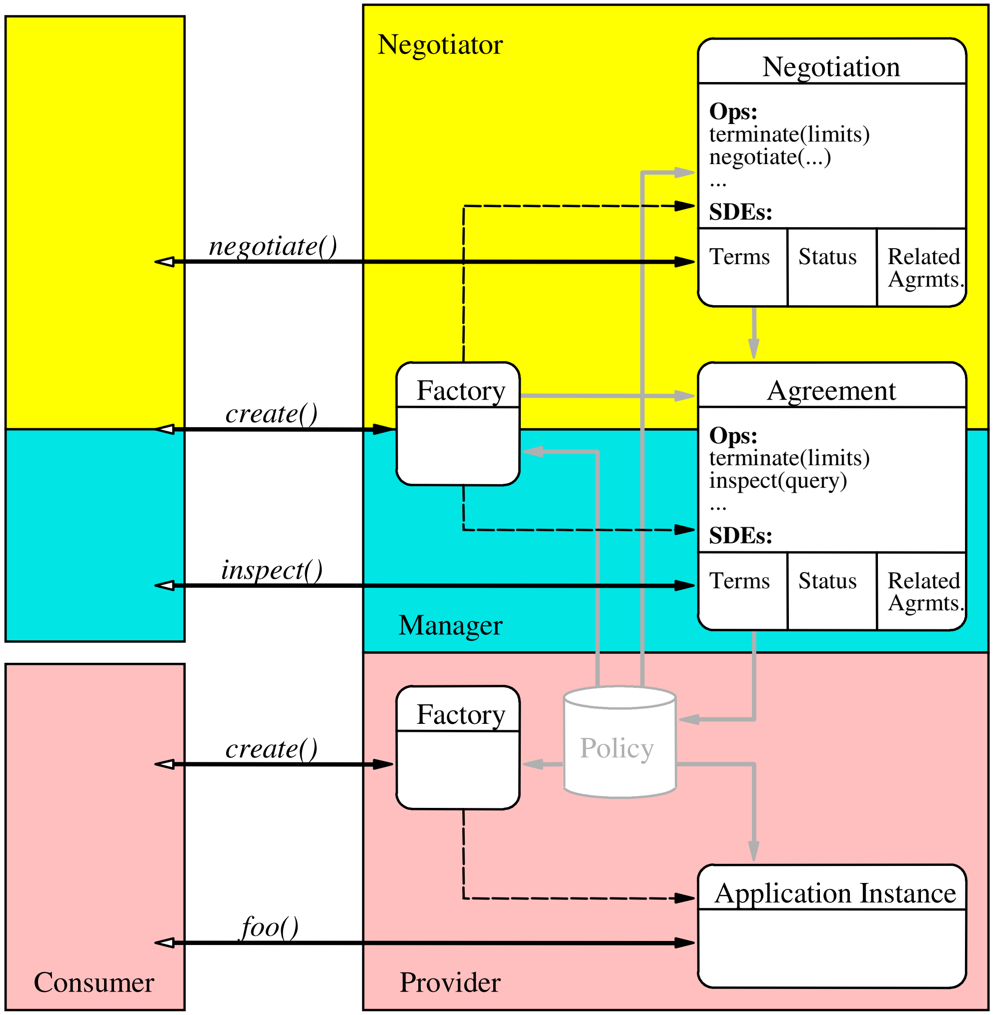


- Explicit Management
  - Negotiation
    - Signaling
    - Coordination
  - Agreement state
    - Domain-specific
    - Obligations
    - Delivery
    - etc.
- Implicit Service
  - Domain behaviors
  - Legacy models
  - Out-of-model
  - Large-scale streams

Composing Interfaces

- Agreement composes with services
  - Arbitrary domain-specific service models
  - “Factory” patterns…
- Negotiation composes with Agreement
- Various composition *styles* make sense
  - Strength of linkage between interface layers
  - Complexity of layered lifecycle model
  - Main approaches examined next…

Merging Agreement/Negotiation



- Composed Model
  - Merged Factory for Agreement and Negotiation
  - Simple and complex dialogues
  - To create/adjust terms of service
  - Add to existing service models
- (Legacy) Service
  - Remains neutral to Agreement model

Examples

- Existing service domain with factories etc.
    - Network transports (TCP/IP socket)
    - Legacy job system
    - Web server
- Merged Agreement+Negotiation Layer
    - Terms of service for current or future services
        - Transport QoS
        - Job response times, node availability
        - Web server query performance

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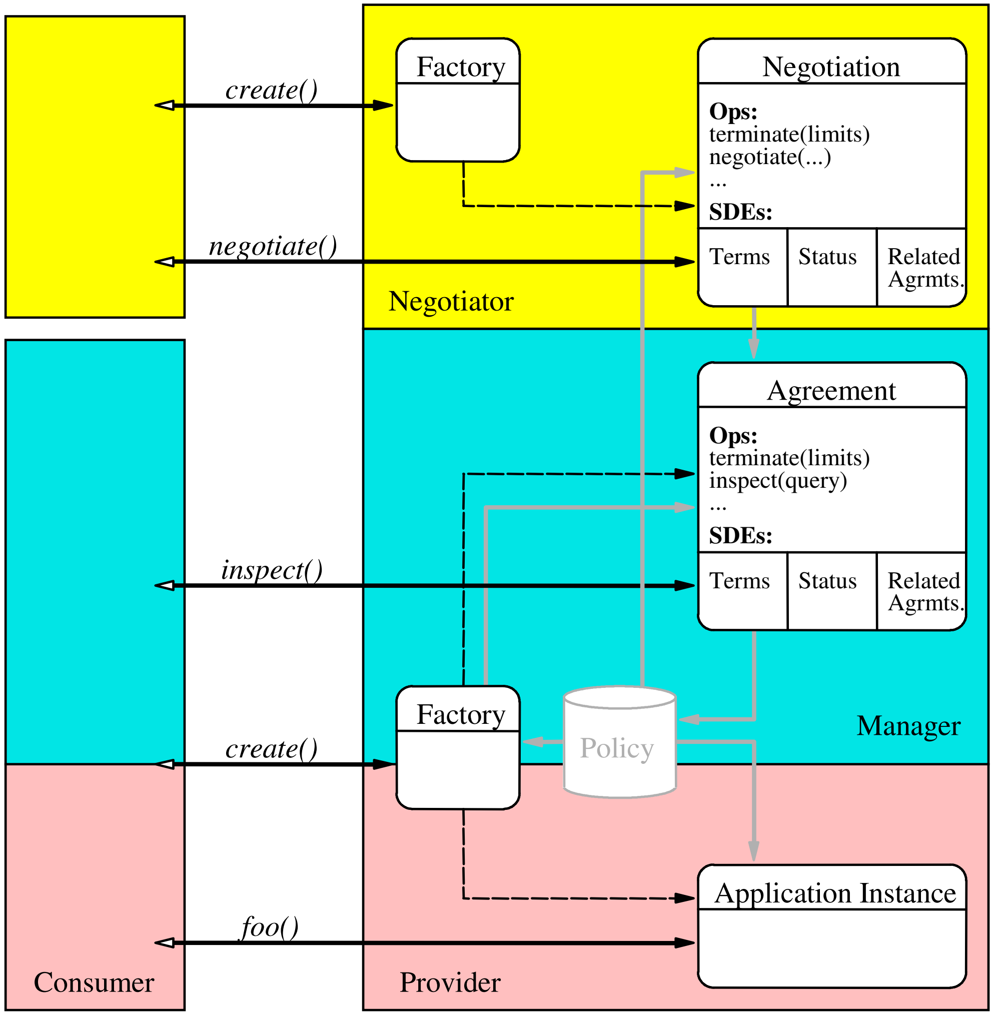
Merging Service/Agreement

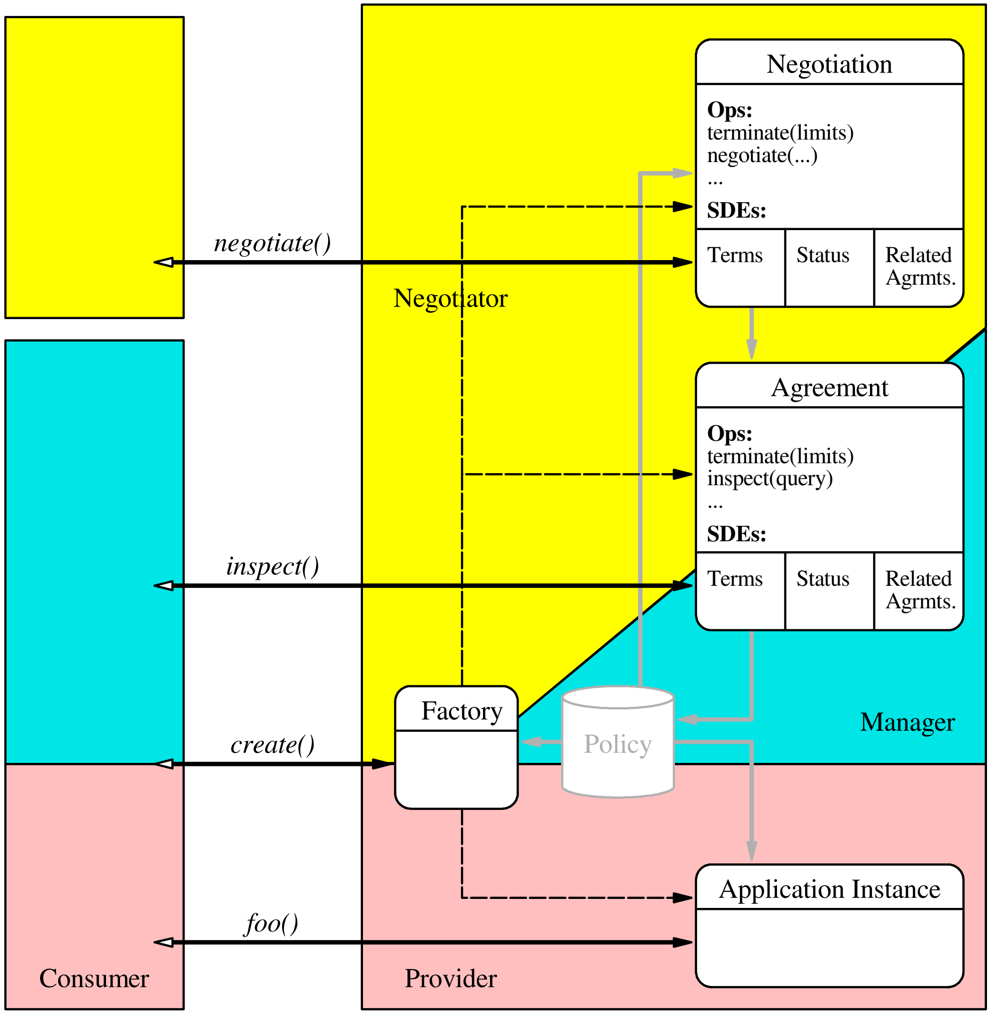


- Negotiation mixes in
  - To adjust terms of service
  - For complex dialogues
- Alternate Composition
  - Merged Factory for service and Agreement
  - Service domain is Agreement-aware
  - Service creation includes QoS terms
  - Simplified lifecycle model

Examples

- Merged Agreement+Service Layer
  - Batch job agreement
  - Database service w/ QoS terms
  - Dataset with storage lifetime terms
- Negotiation Layer
  - To adjust existing agreement
    - Change QoS terms, lifetime, etc.
  - To establish complex agreements
    - More rich dialogue than factory create()

Merging All Models



- Full composition
  - Merged Factory for Service, Agreement, and Negotiation
  - Simple and complex scenarios
  - Service is management-aware
- Three instance layers
  - Always the same
- Various Factory models
  - Depend on composition

Suggested Approach

- WS-Agreement has two instance types
  - Agreement
  - Negotiation
- Plus, several Factory idioms
  - Simple Agreement and Negotiation Factories
  - Merged NegotiableAgreementFactory
  - Suggested extensibility types
    - For composing with domain-specific Factories
- Domains choose composition

Binding to Service

(Suggested Approach continued…)

- Agreement describes *binding* to service
  1. Specific service(s) *by reference*
  2. Service(s) *to be created* as per agreement, or
  3. Sets of externally-generated services bearing *identifying attributes*
     - Attributes are domain-specific
- Service actions may be triggered by either party
  - Actions are domain-specific

Claiming Agreements

- Some Agreements are complete
  - ◆ Described service behaviors/obligations can be met without further interaction between negotiating parties: run a batch job
- Some Agreements need claiming
  - ◆ Party (or parties) not obligated to do anything unless some other action occurs in environment: prioritize packets
- Claiming is a domain-specific concept

Dependent Agreements

- One domain for Agreement is to obligate a response to *further negotiation*
- Agreement is claimed by trying to make another dependent agreement
  - Job negotiation claims against reservation
  - Job system is obligated to satisfy reservation
- Model recursion using meta-agreements…
  - Chains of agreement eventually terminate in binding to non-agreement service domain

Up Next: the Details

- Agreement offers and result
  - Terms
  - Negotiability constraints
- Port types and operations
  - The messages
- State models
  - Negotiation state (leading to observation)
  - Observation state (satisfaction/violation)