UML
The View from the Front

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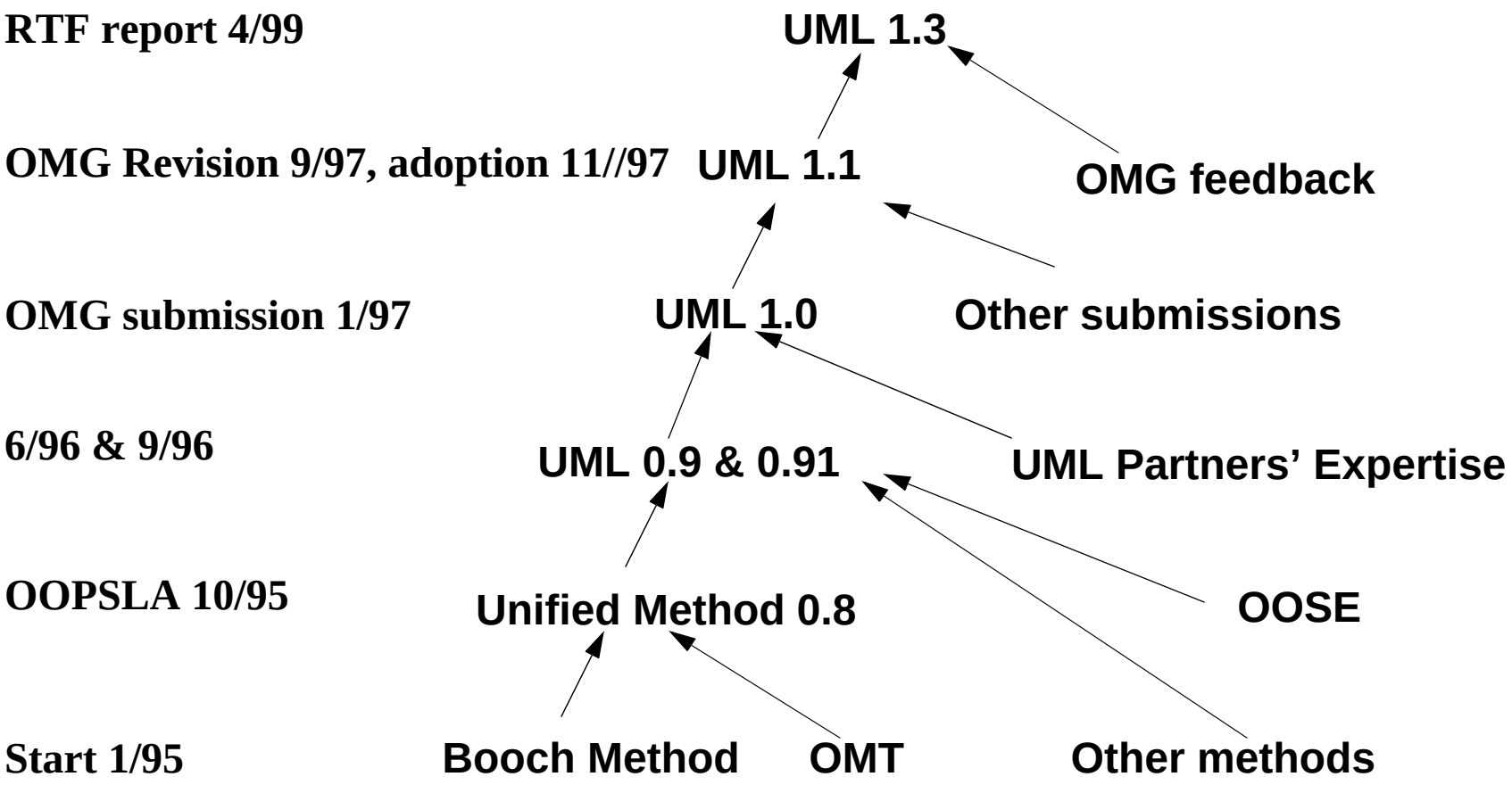
Rational Software Corporation

Evolution of the UML



UML Revision Goals

- Fix typographical errors and omissions
- Fix technical bugs and inconsistencies
- Clarify ambiguities and special cases
- Adjust discrepancies in naming and organization

Revision Schedule

- Formed committee of 12 persons
- Cris Kobryn was chairman
- Began work December 1997 after OMG adoption
- Completed technical changes December 1998
- Final UML version 1.3 report due April 1999
- Supplement for XMI and IDL compatibility 1 or 2 months later

Revision Process

- Users submit comments through OMG
- Organize comments in a database
- Perform internal consistency checks on UML documents
- Discuss changes in telephone and OMG meetings
- Assign workgroups to update documents

Workgroup Areas

- Static structure
- Model management
- Use cases and collaborations
- State machines
- Activity graphs
- OCL language
- IDL format
- UML architecture and standards issues

Nature of Changes

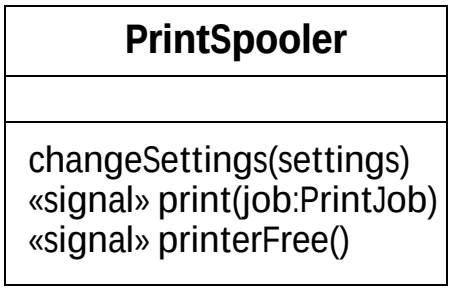
- Over 500 comments submitted
- A few changes important to most users
- A moderate number of changes important for special areas
- Many clarifications of wording and interpretation
- Many typos fixed
- Lots of small internal issues of interest only to toolmakers or UML groupies
- Many comments were declined as incorrect or out of scope

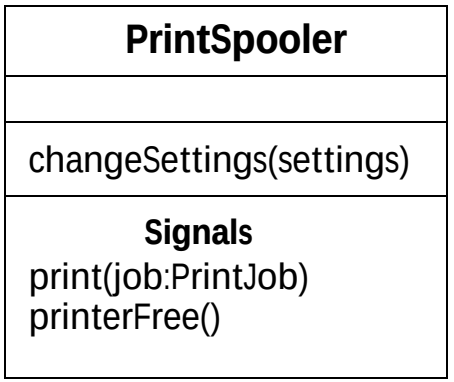
Static Structure Revisions

- **Allowed associations *from* Classes *to* Interfaces**
- **Removed unnecessary Generalization stereotypes**

  extends, inherits, private, subclass, subtype, uses -> implementation
- **Allowed Classes to declare Signals**
- **Reorganized and renamed Dependencies**

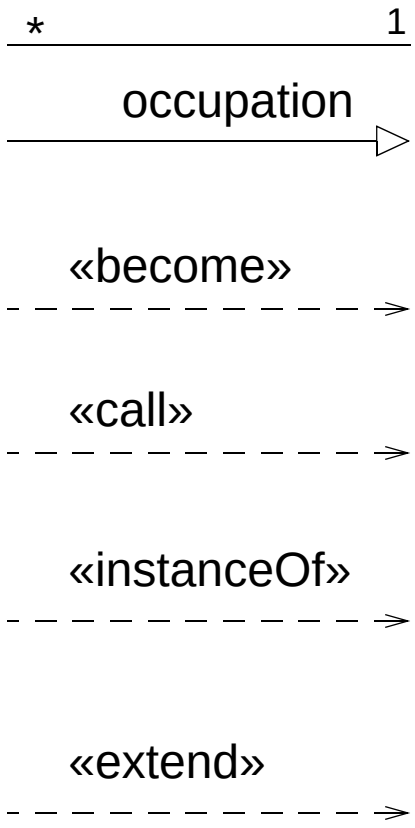
Classes Declaring Signals





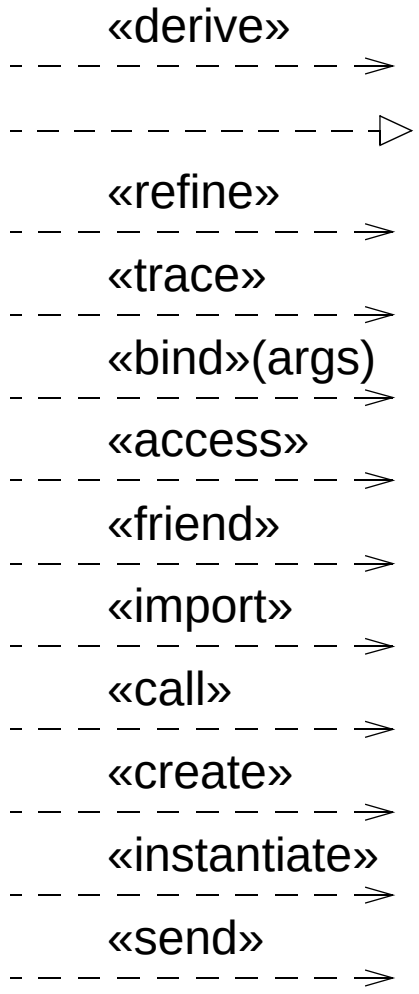
Relationships

- **Association**
- **Generalization**
- **Flow**
  - **become, copy**
- **Dependency**
- **Metarelationship**
  - **instance, powertype**
- **Use Case**
  - **extend, include**



Dependencies

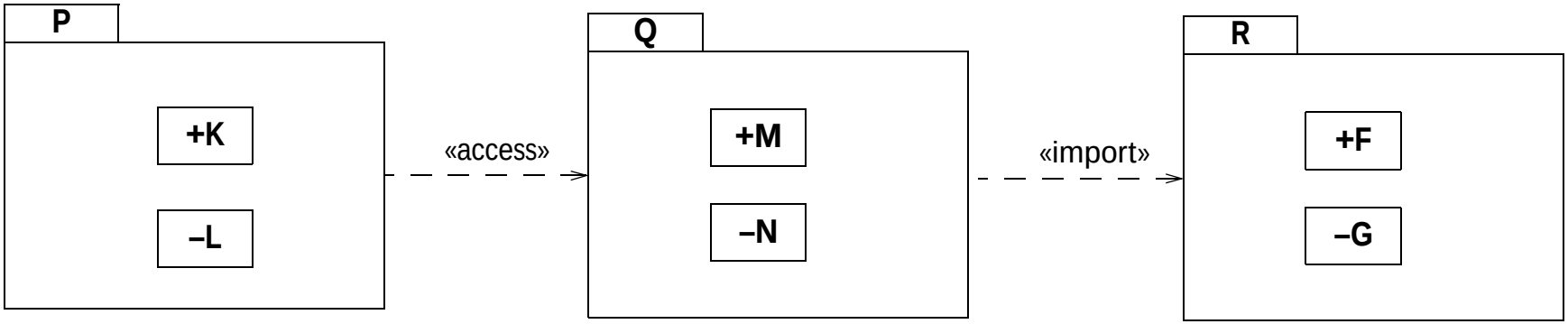
- **Abstraction**
  - **derivation, realization, refinement, trace**
- **Binding**
- **Permission**
  - **access, friend, import**
- **Usage**
  - **call, create, instantiate, send**



Model Management Revisions

- **Distinguished «access» Permission from «import»**
  - **access: permit access**
  - **import: load namespace**
- **Defined Subsystem with multiple viewpoints**
  - **specification**
  - **implementation**
  - **others possible**

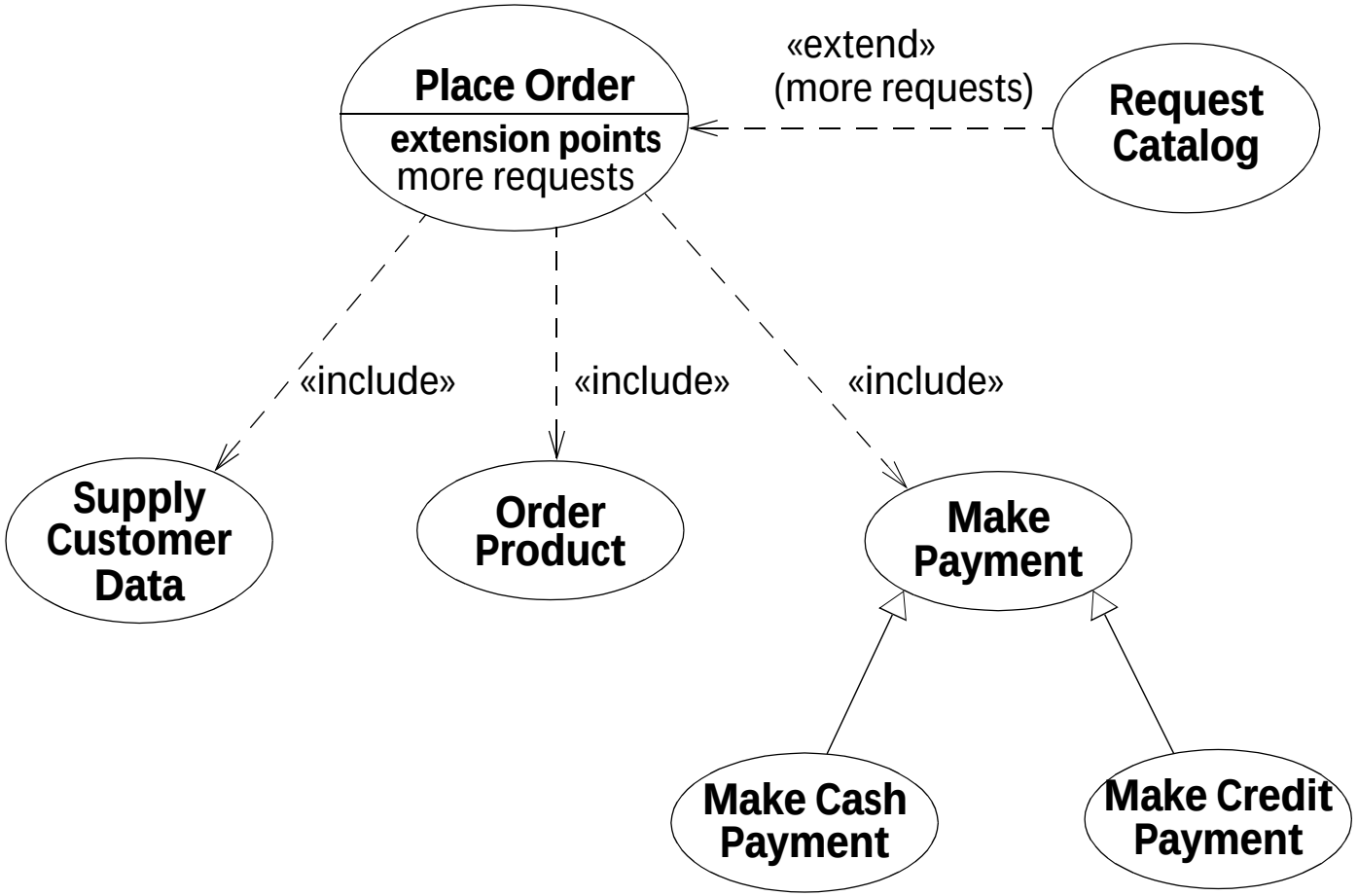
Permissions



Use Case Revisions

- Replaced «uses» relationship with Generalization and «include» dependency
- Reclassified «extend» relationship as a Dependency
- Defined format of «extend» relationship and extension points

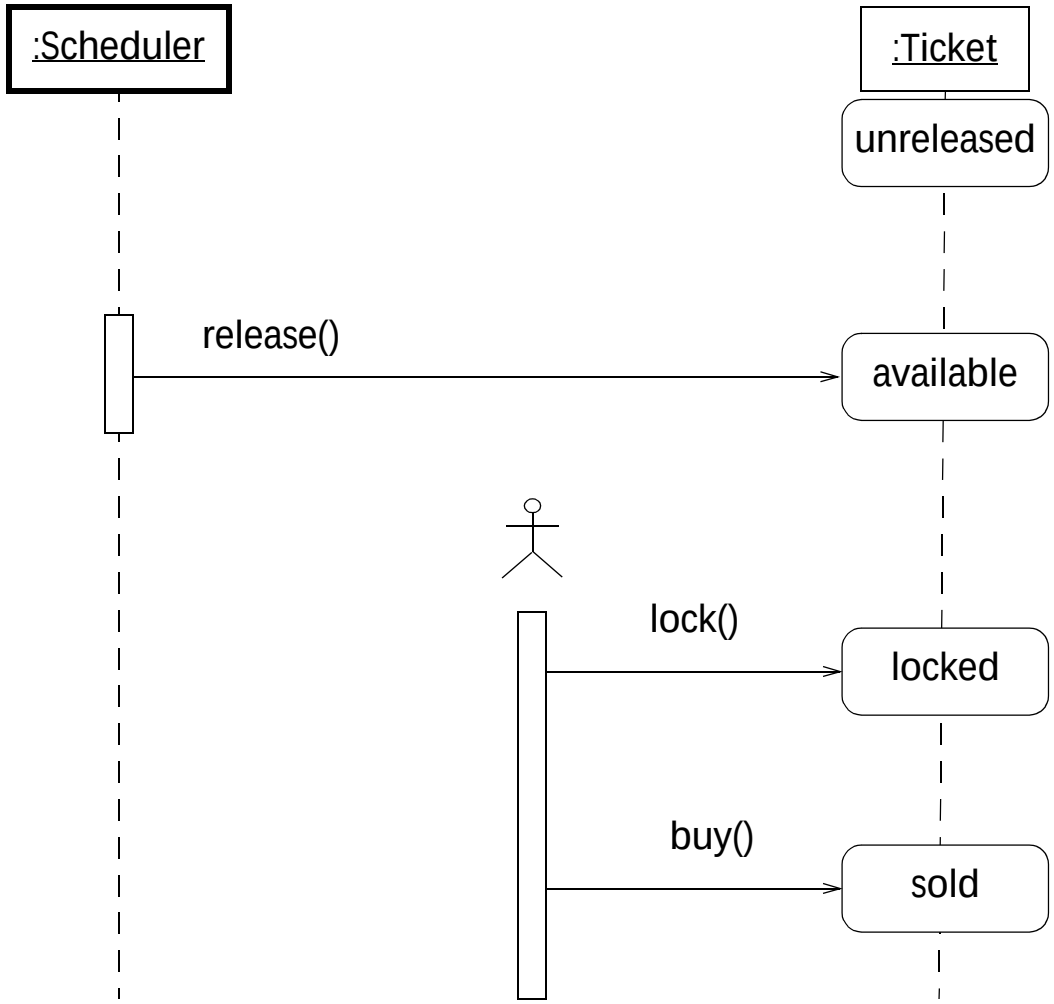
Use Case Relationships



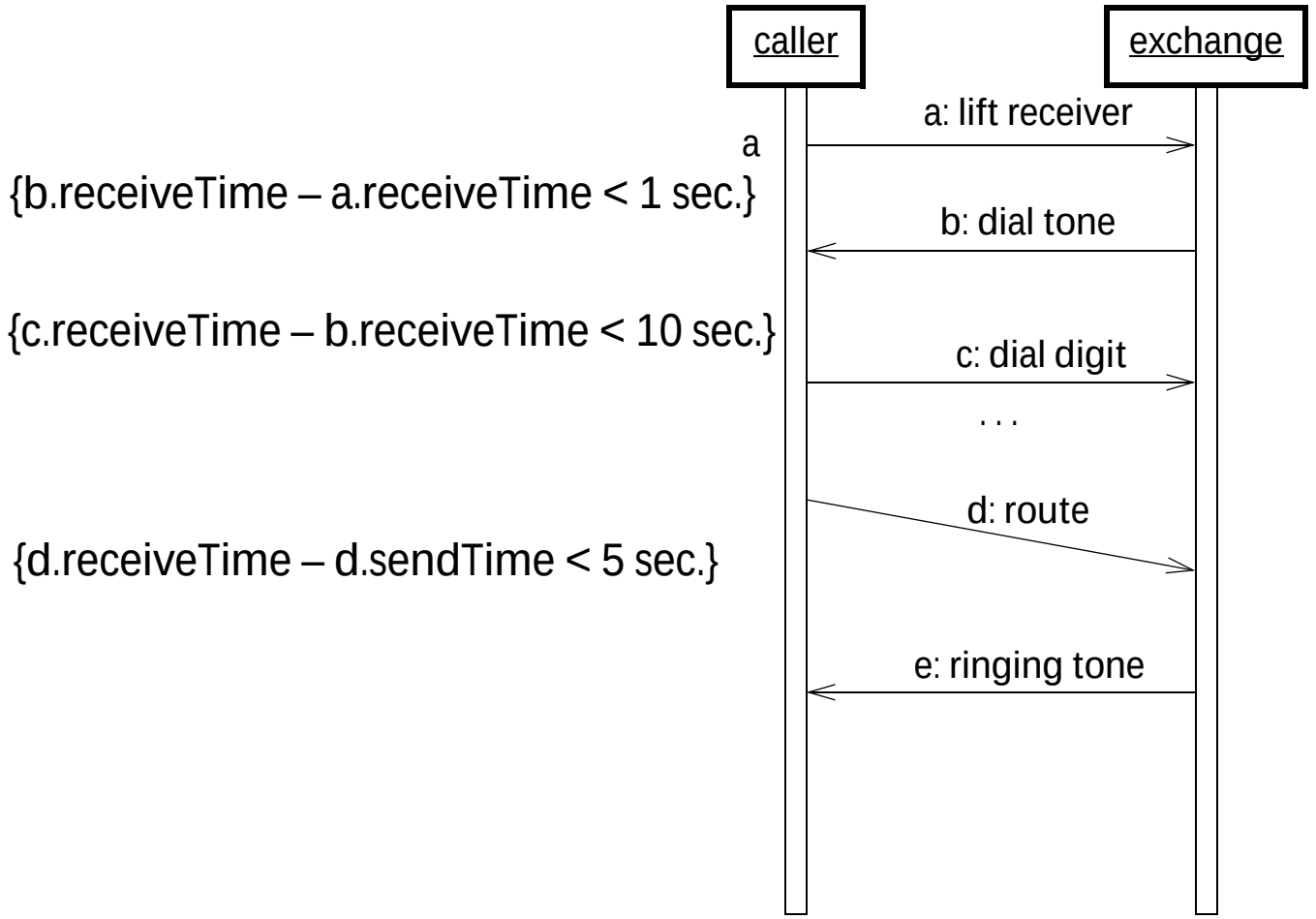
Sequence Diagram Revisions

- Allow states on lifelines to show change of state during execution
- Replaced timing marks by functions on message names
- Show either objects or roles in an interaction

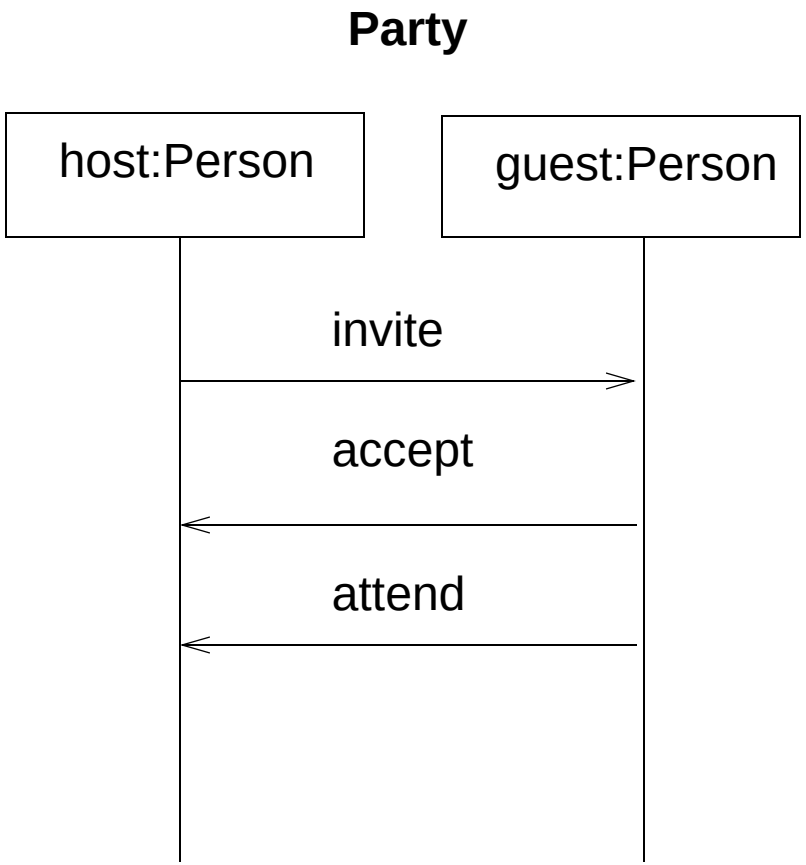
State on Lifeline



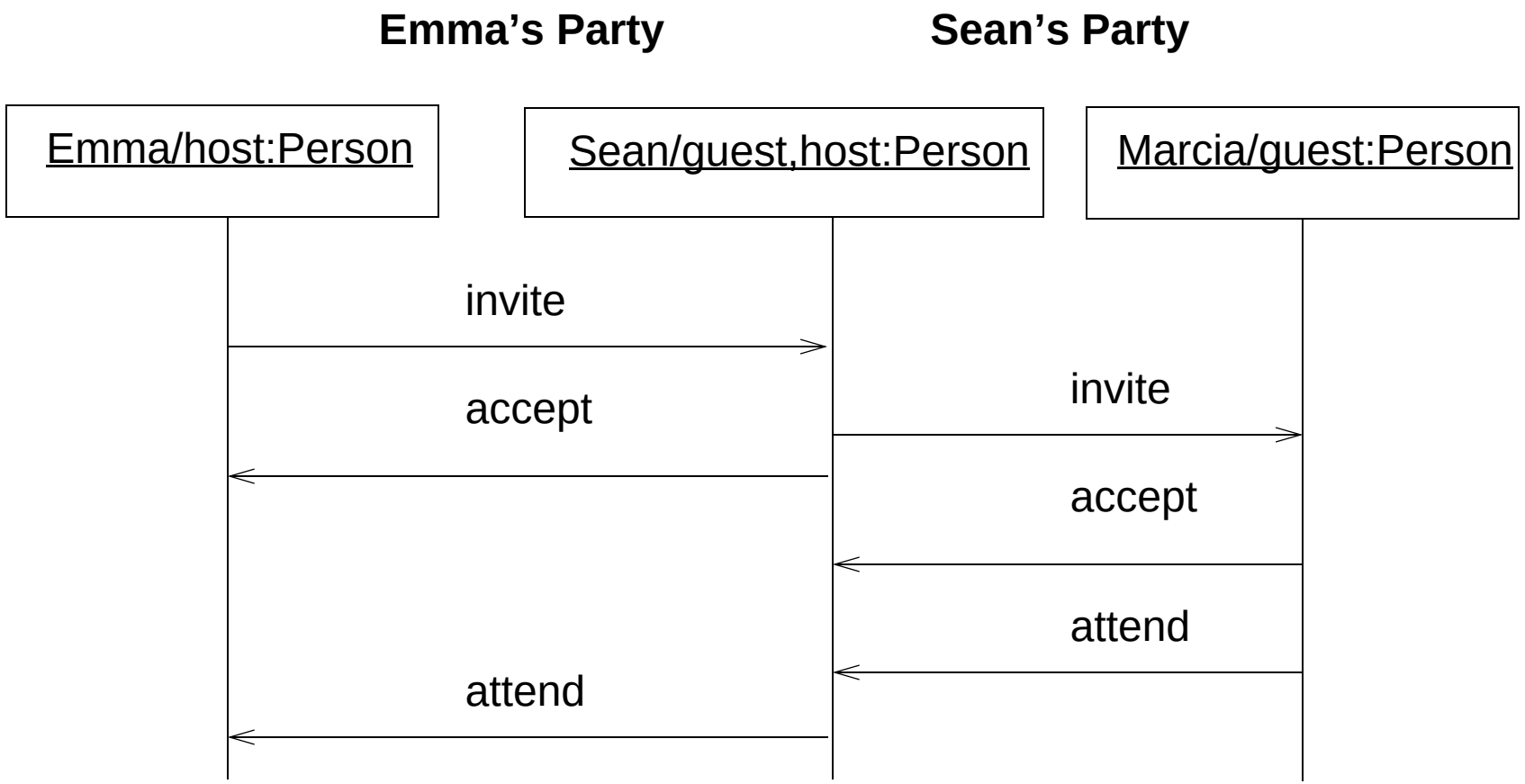
Timing Functions



Roles vs. Objects: Roles



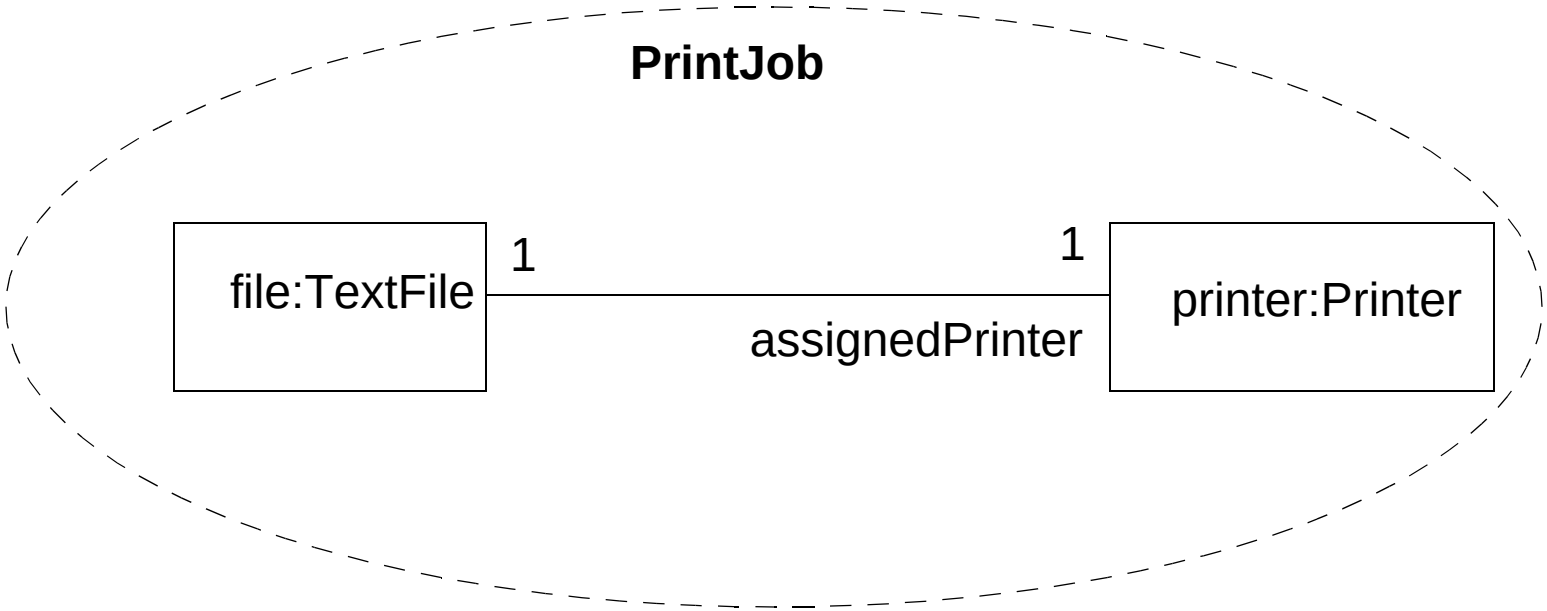
Objects



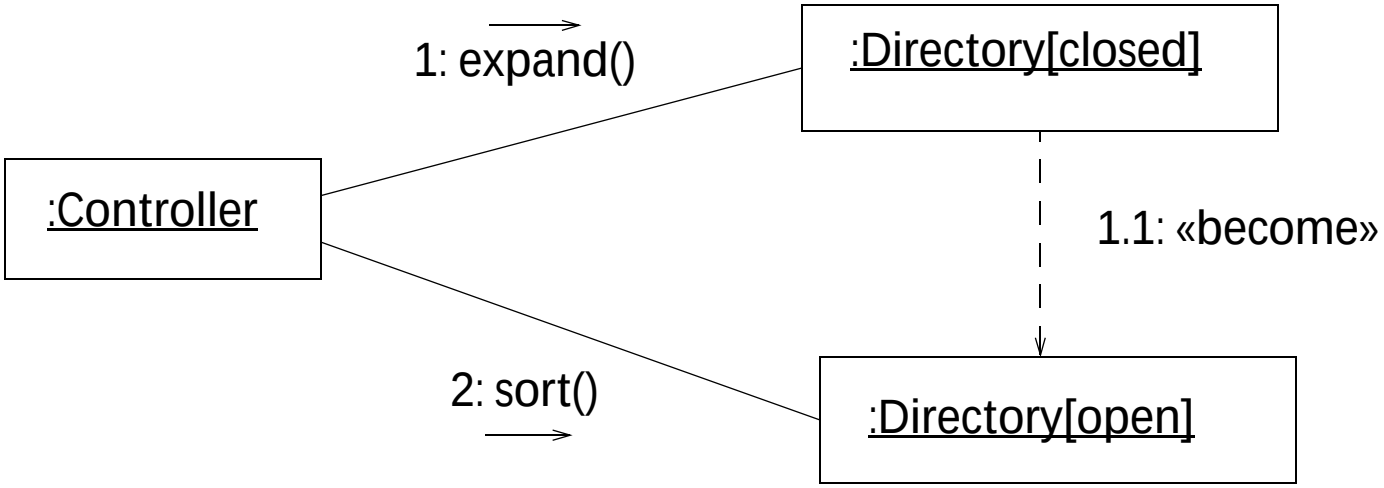
Collaboration Diagram Revisions

- Automatically generate base association if not explicit
- Allow sequence numbers on «become» and «copy»
- Apply actions concurrently to set of target objects

Collaborations



Become and Copy



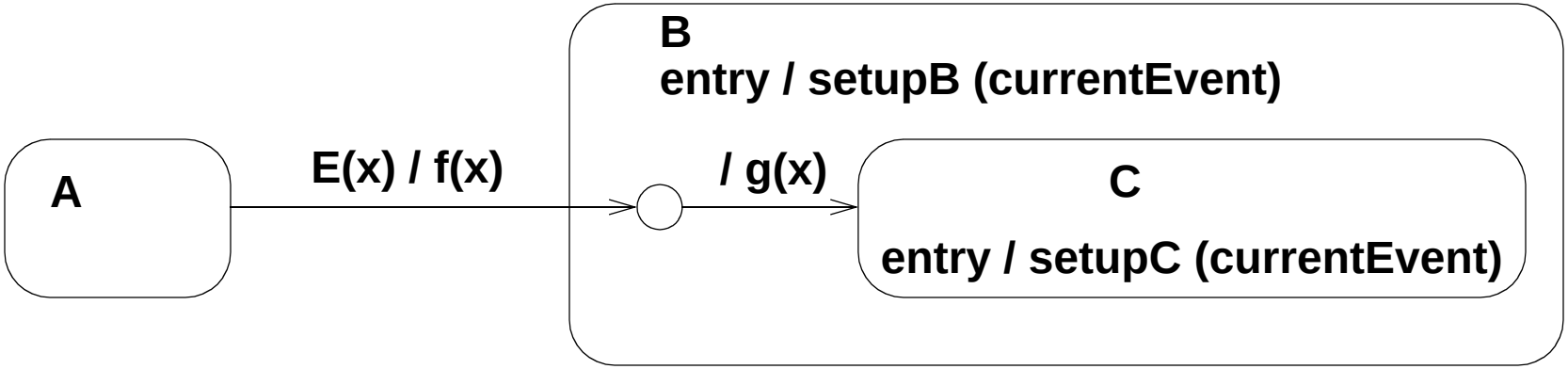
Multiple Targets of Action

targets . op (arguments)

State Modeling Revisions

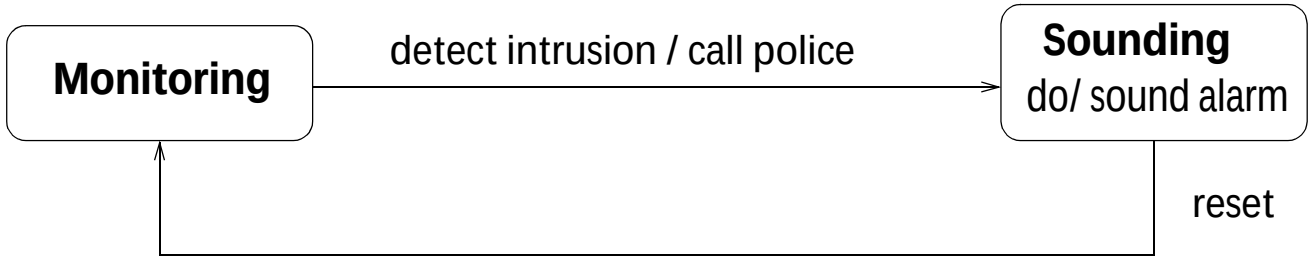
- Added currentEvent to handled chained transitions
- Dropped special syntax (^) for sending signals
- Added continuous activity to states
- Allowed call events as alternative implementation of operation calls

Chained Transitions



E(x) / f(x); setupB (E(x)); g(x); setupC (E(x))

Continuous Activity

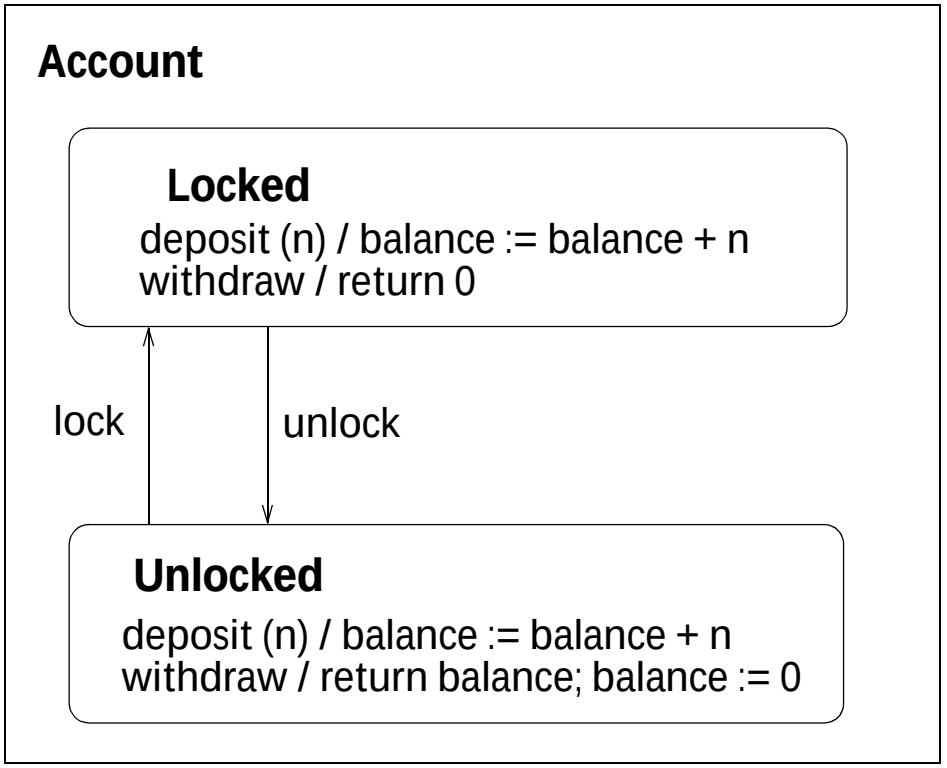


Call Events

calling procedure text

```
deposit (10);
. . .
amount := withdraw ( )
```

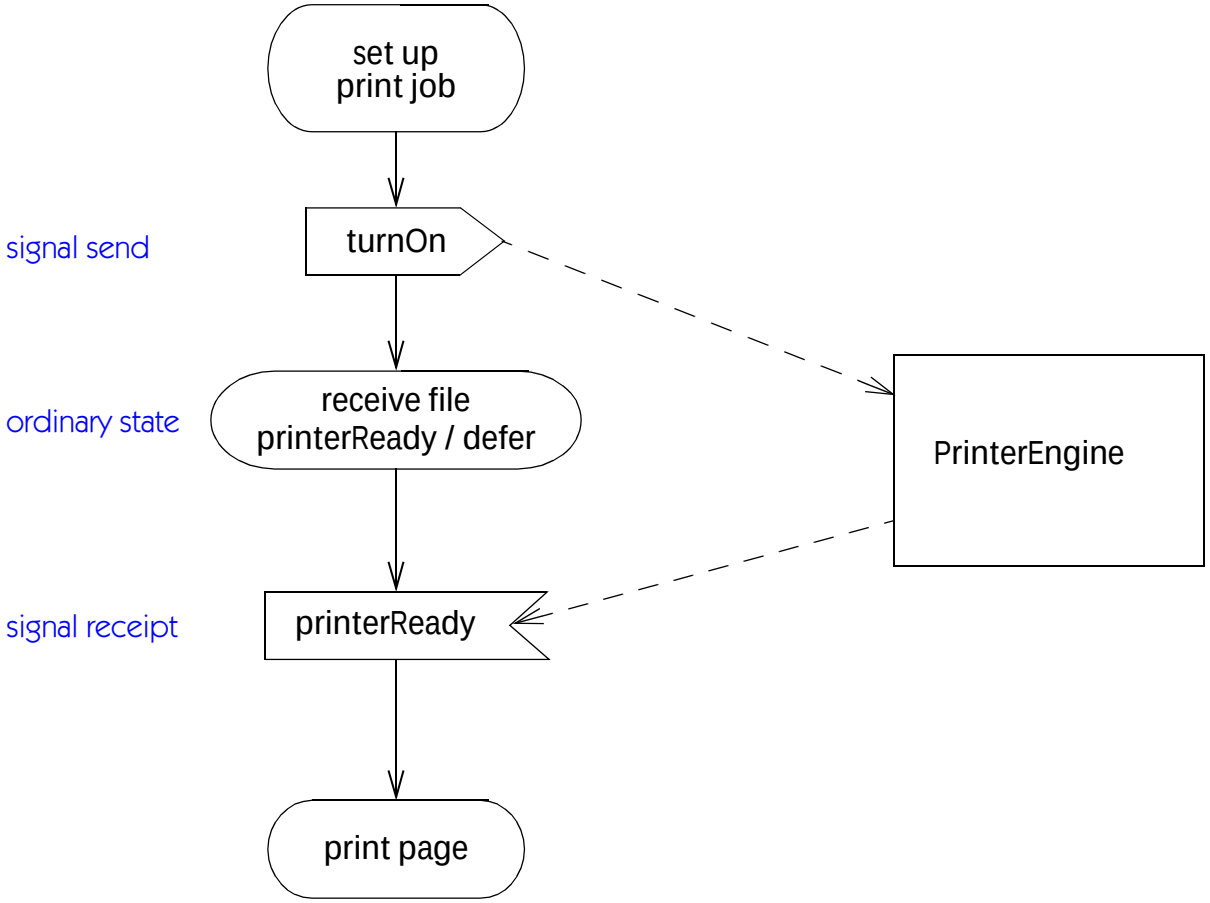
Get all or nothing depending on whether the account is locked.



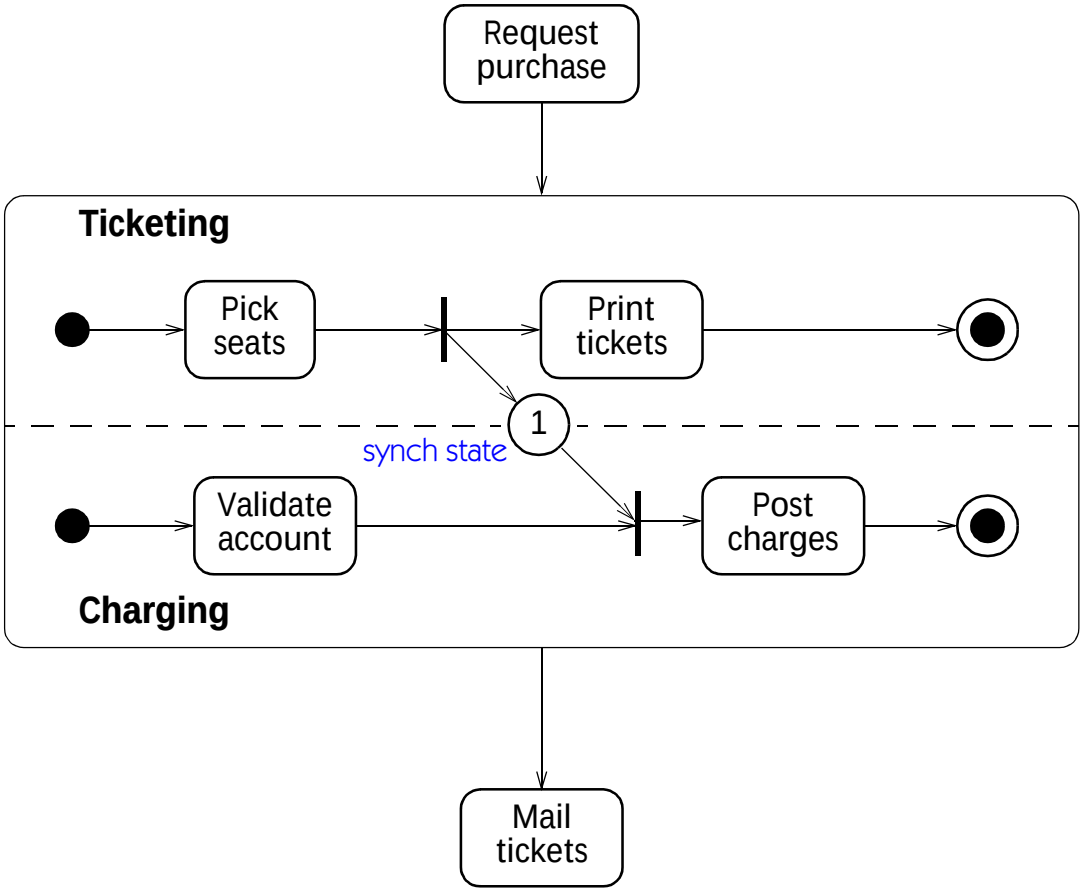
Activity Graph Revisions

- Allowed events to be deferred in states
- Provided synch states for synchronizing concurrent activities
- Added special icons for sending and receiving signals, conditional threads
- Added dynamic control of spawning parallel subactivities

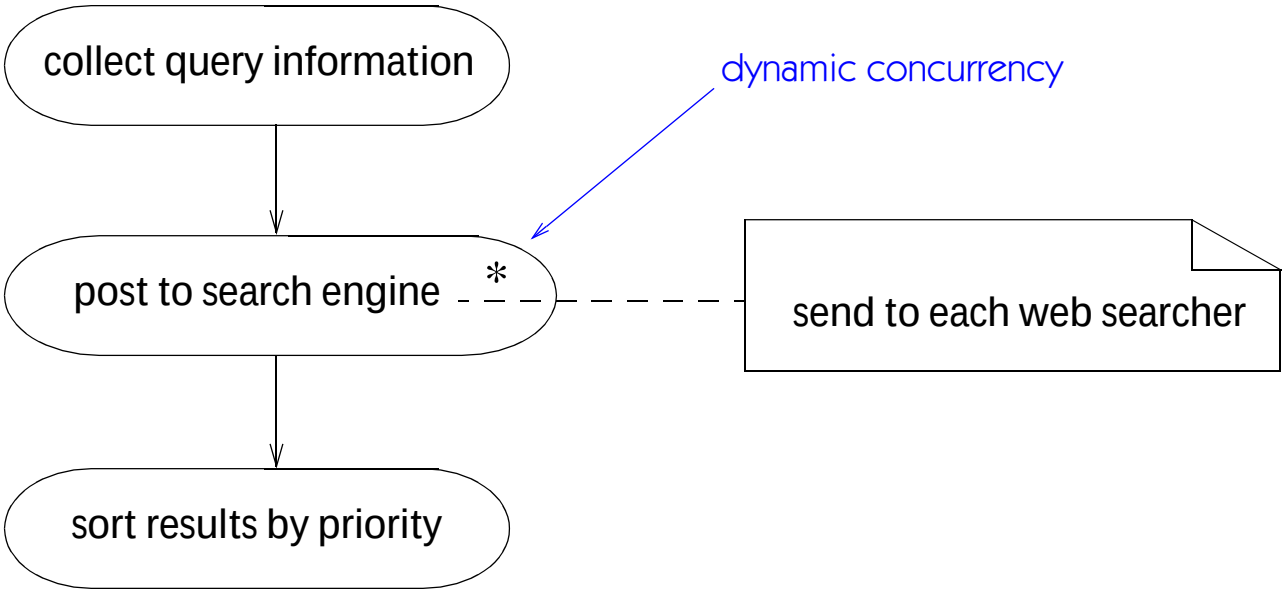
Deferred Events and Special Icons



Synch States



Dynamic Parallelism



Existing RFPs for Extensions

- Stream-based model interchange using XML
- Semantics of executable models (“action language”)
- Profile for business enterprise modeling
- Real-time systems (architecture, performance, reliability)

Other Interim Issues

- Standard way to define profiles
- Diagram interchange formats

Possible Topics of UML 2.0

- First-class extensibility mechanism
- Precise specification of refinement semantics
- Versioning of models
- More permissive concurrency in activity and state graphs
- Associations at several levels

UML Assessment

- Clearly the dominant modeling language
- Not as clean as if one person had made it, but much better accepted
- Some mechanisms should be more general in the future, but a conservative approach was probably best
- Standard elements are uneven, probably need cleanup
- Pressures to apply UML widely, possibly beyond its intent
- Danger of incoherence if too many independent OMG RFPs push UML in different directions
- Vendors and users will provide pragmatic pushback to untried theory