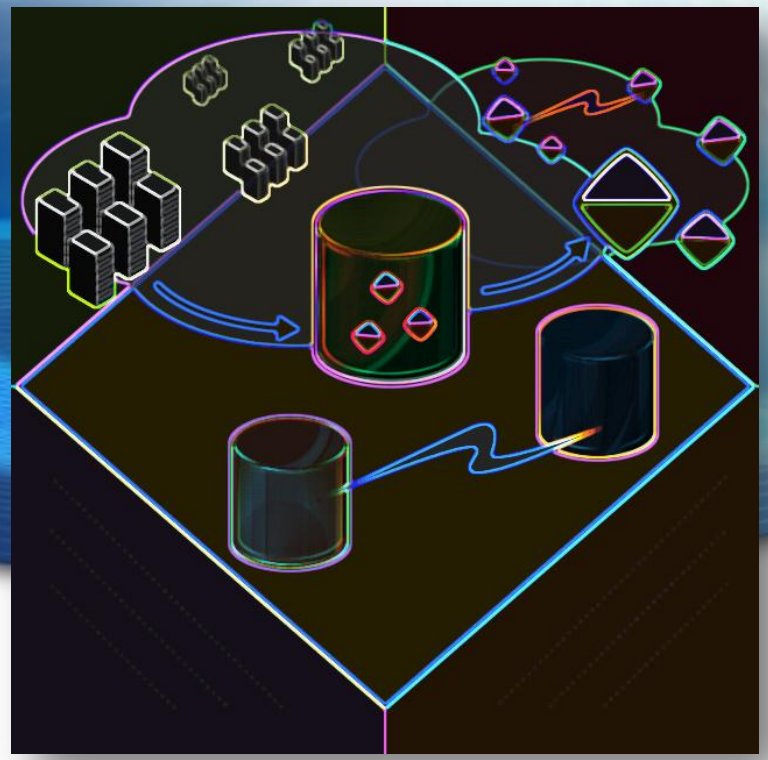
Microsoft

EXTREME COMPUTING GROUP

Defining the future.



Orleans: Cloud Computing for Everyone

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eXtreme Computing Group, Microsoft Research

SOCC, October 27th, 2011

Cloud Programming Must Get Simpler!

SW Design GUI	OOP MVC
Server Applications	Java .NET
Web	JSP ASP.NET Ruby on Rails
Cloud	Orleans

Orleans = Programming Model + Distributed Runtime

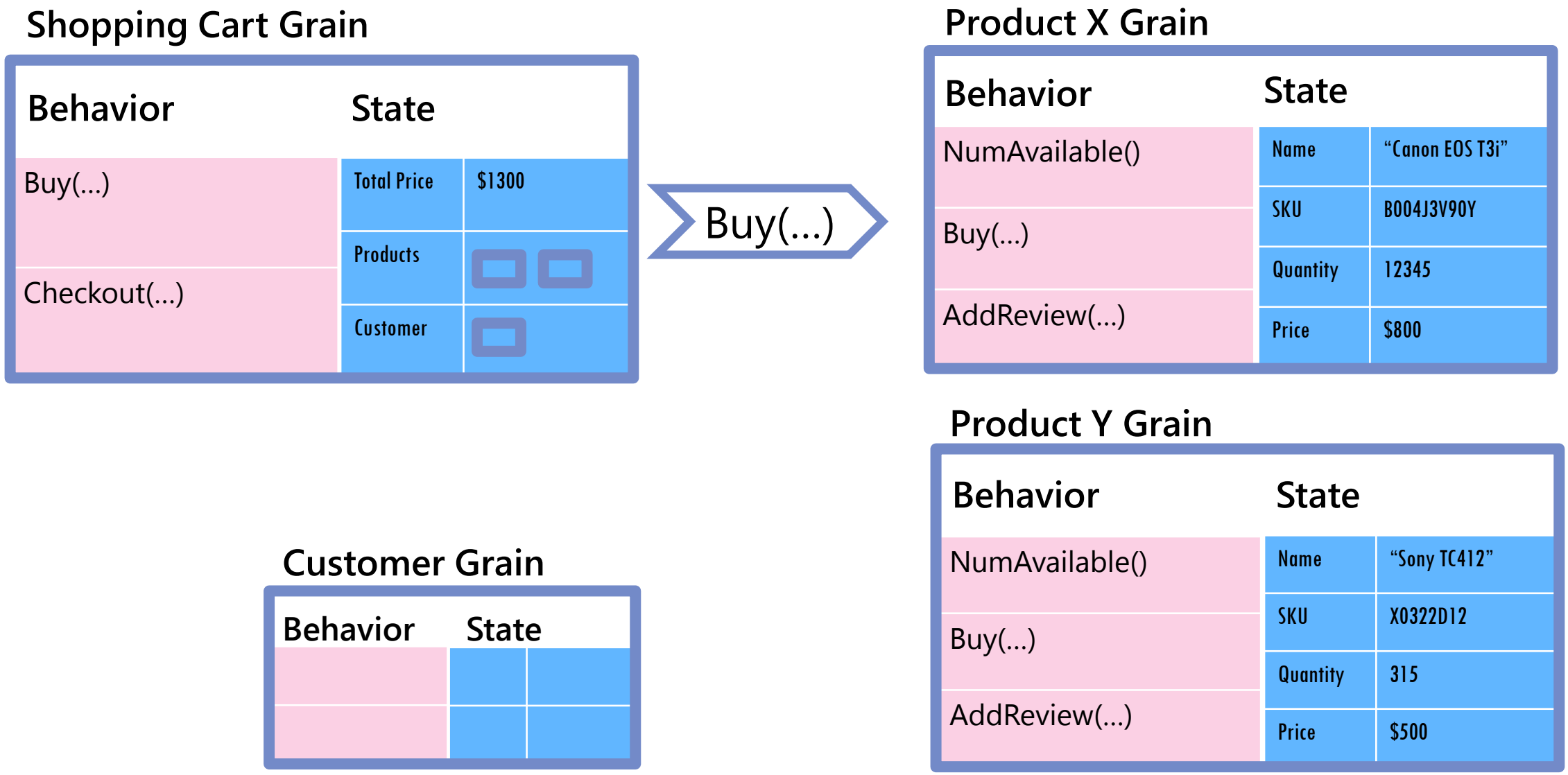
Applications

Orleans
Programming Model
Distributed Runtime

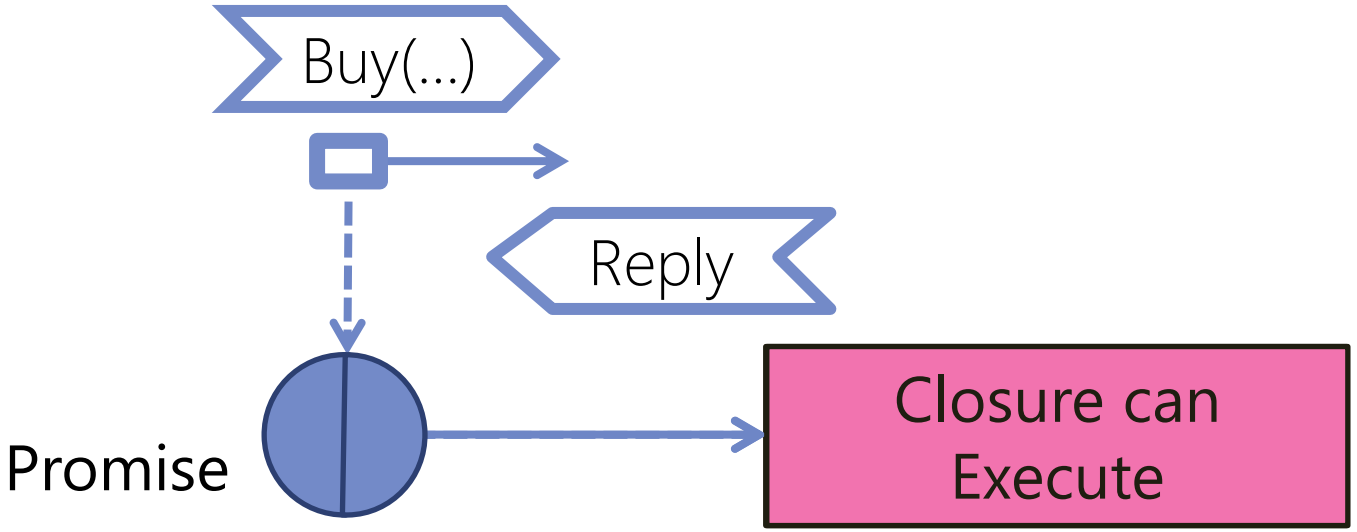
.NET + Azure

- Simplified Programming Model
- Transparent Scalability
- Adaptive Performance Management

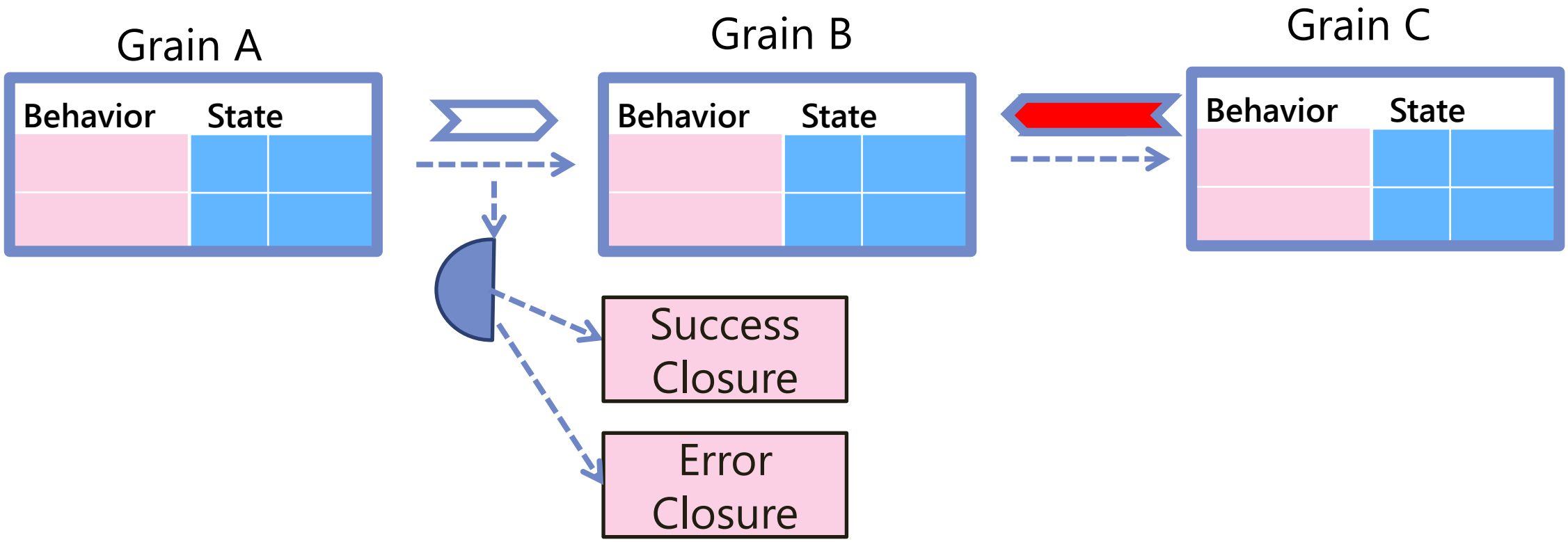
Grains


Shopping Cart Grain
Behavior
State
Buy(...)
Checkout(...)
Total Price
$1300
Products
Customer
Buy(...)
Product X Grain
Behavior
State
NumAvailable()
Buy(...)
AddReview(...)
Name
"Canon EOS T3i"
SKU
B004J3V90Y
Quantity
12345
Price
$800
Product Y Grain
Behavior
State
NumAvailable()
Buy(...)
AddReview(...)
Name
"Sony TC412"
SKU
X0322D12
Quantity
315
Price
$500
Customer Grain
Behavior
State

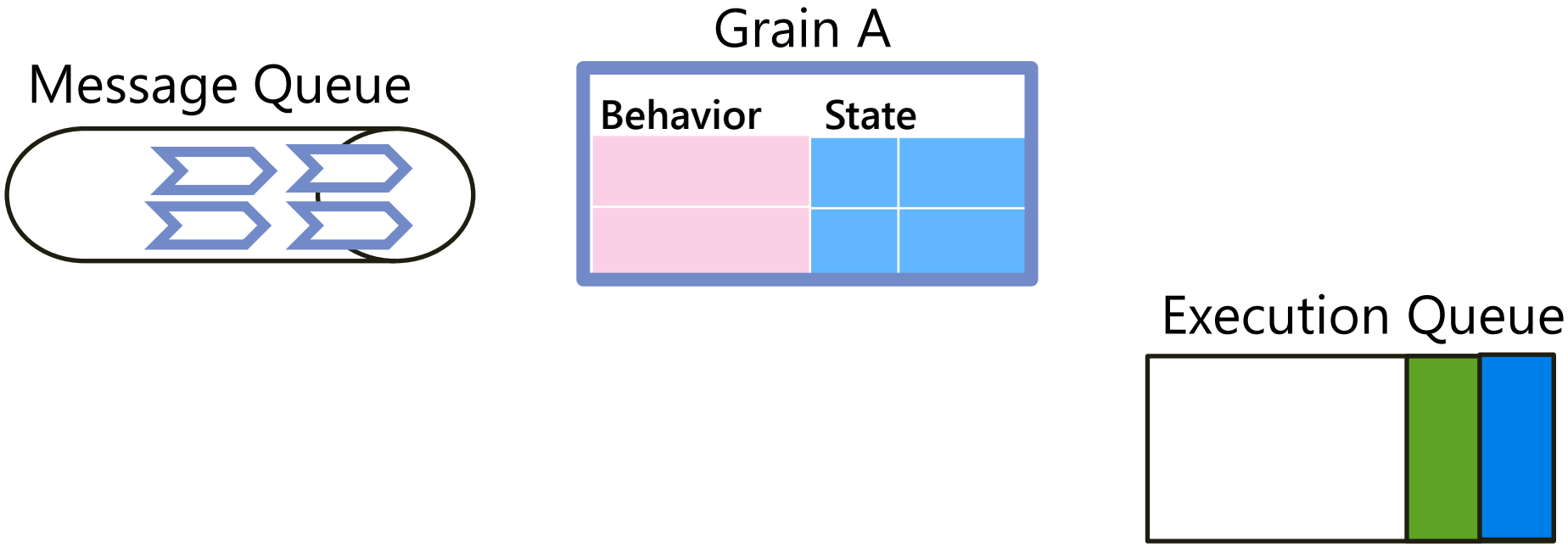
Asynchronous Communication and Promises



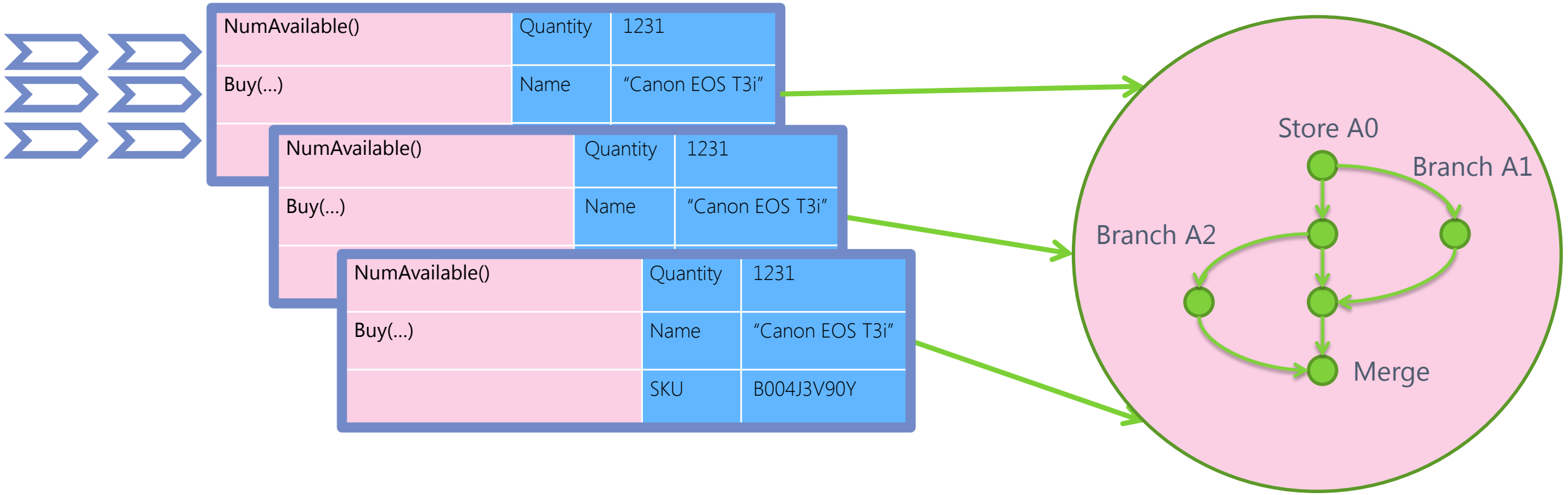
Simplified Error Handling



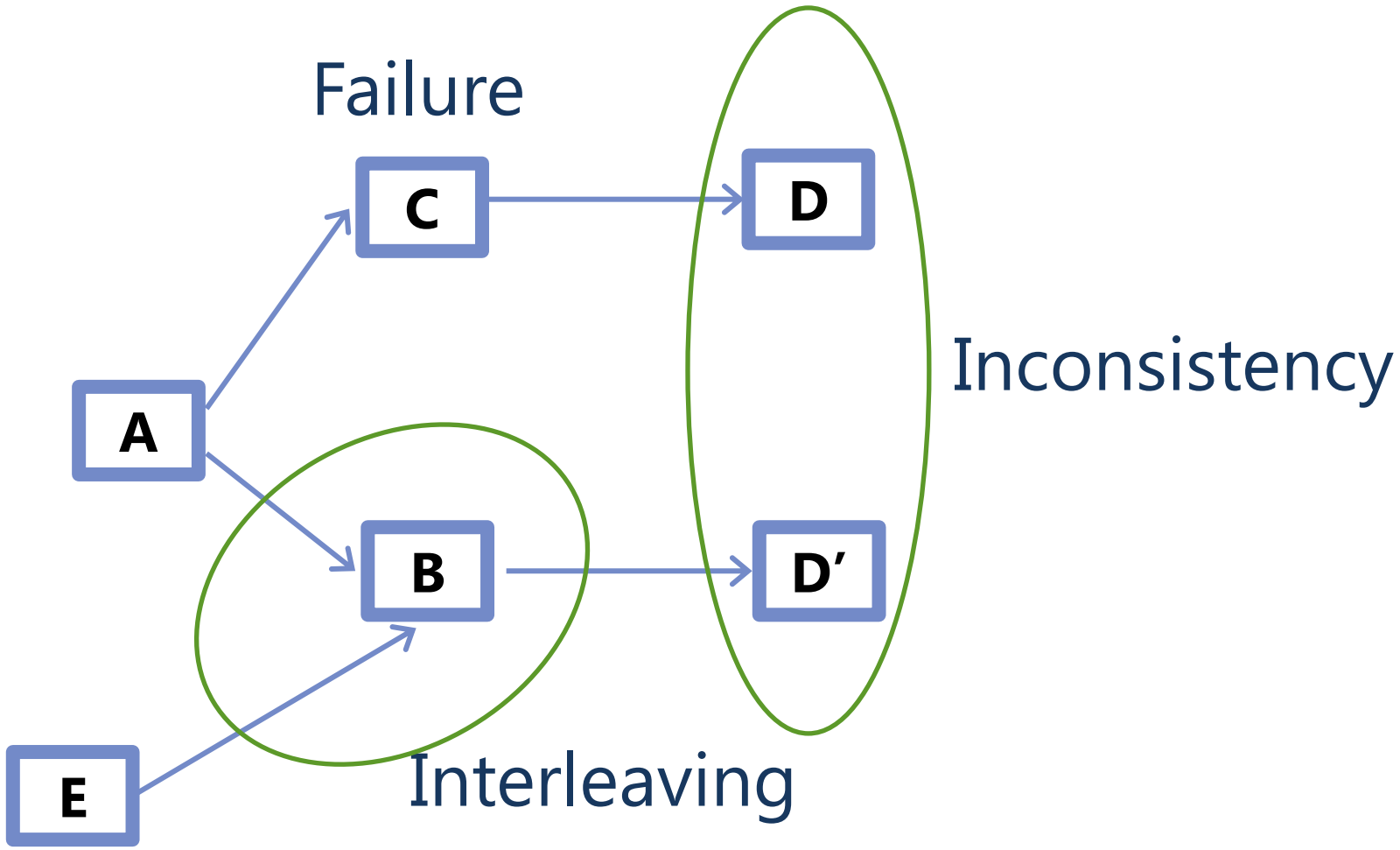
Single Threaded Execution Model



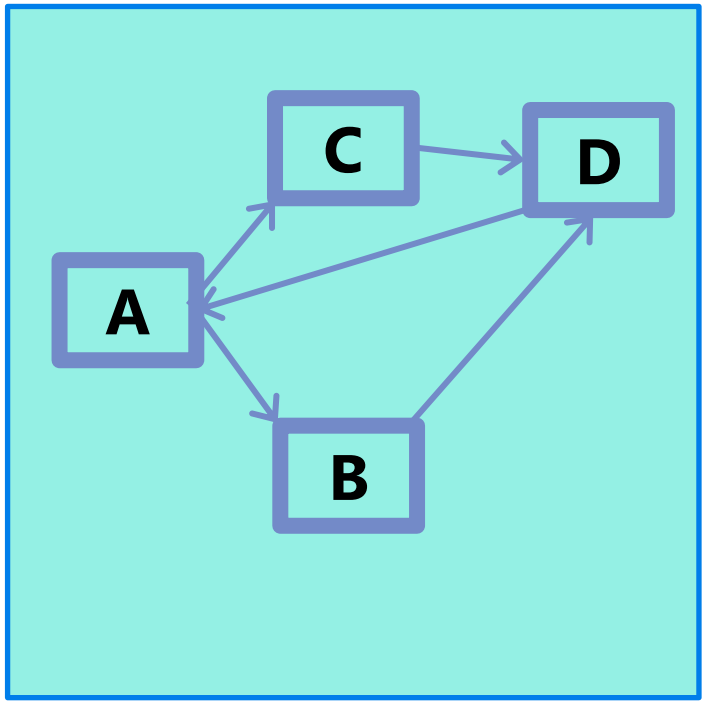
Activations

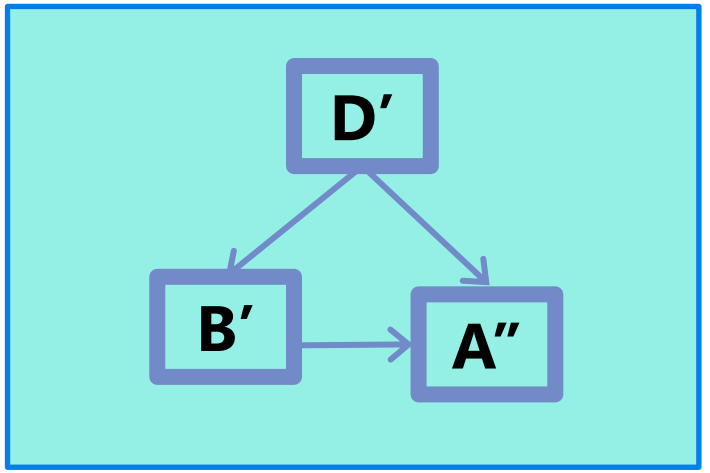


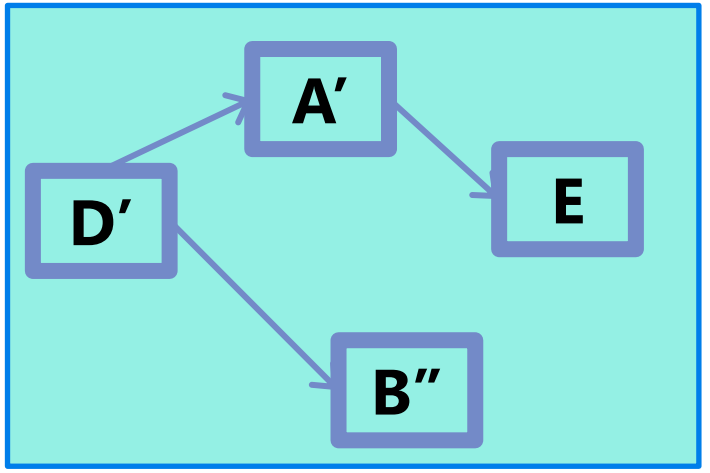
What could go wrong?



Lightweight Transactions

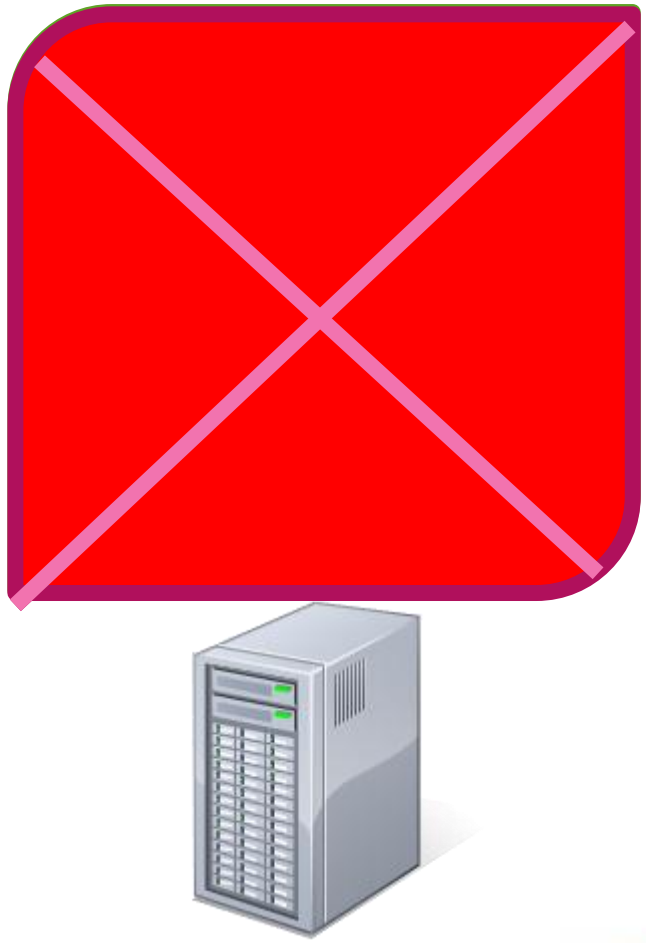




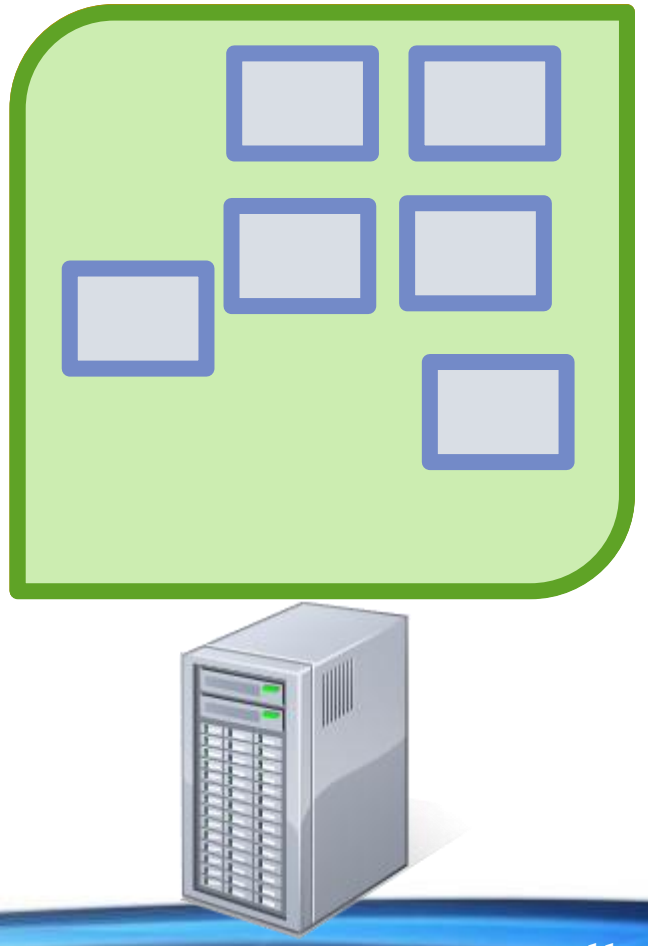


Adaptive Runtime

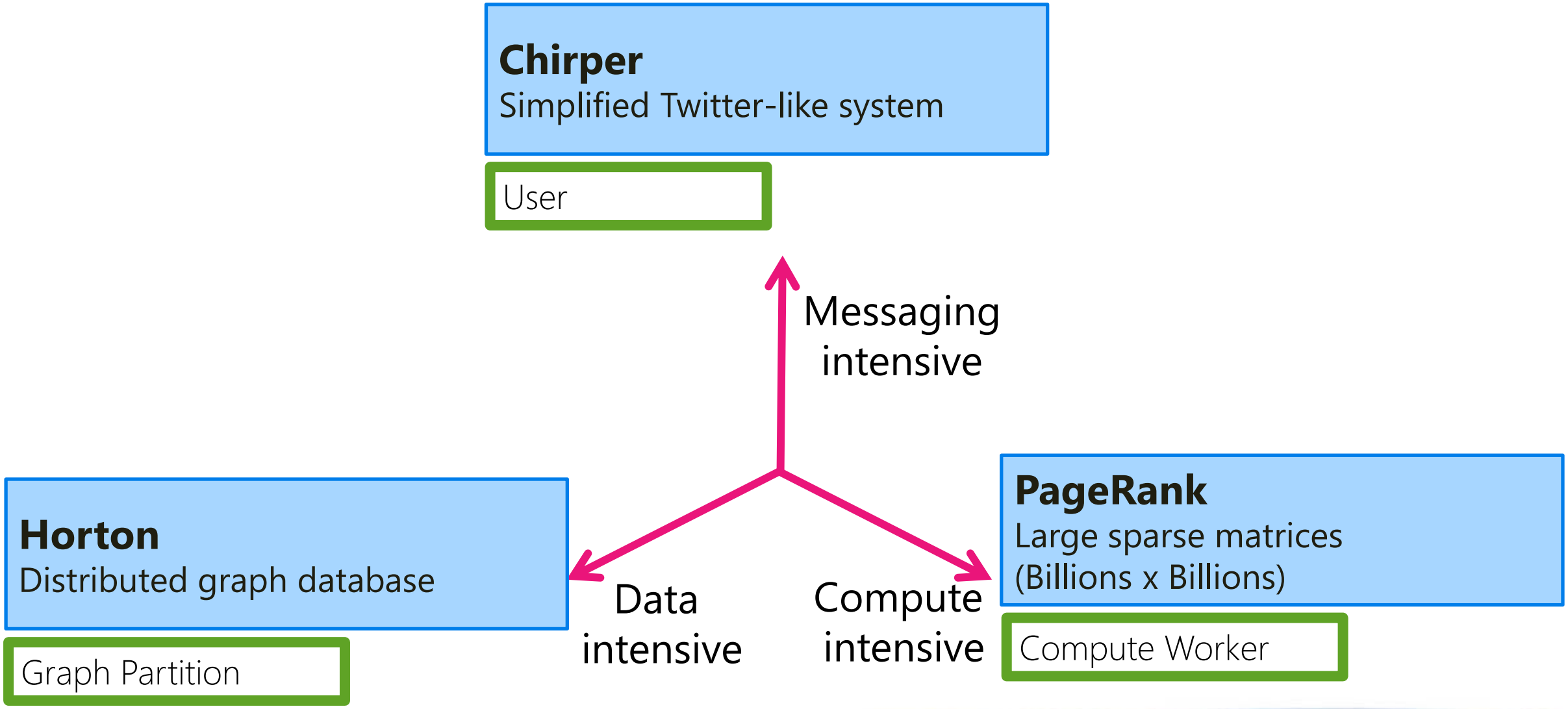
Silo



Silo

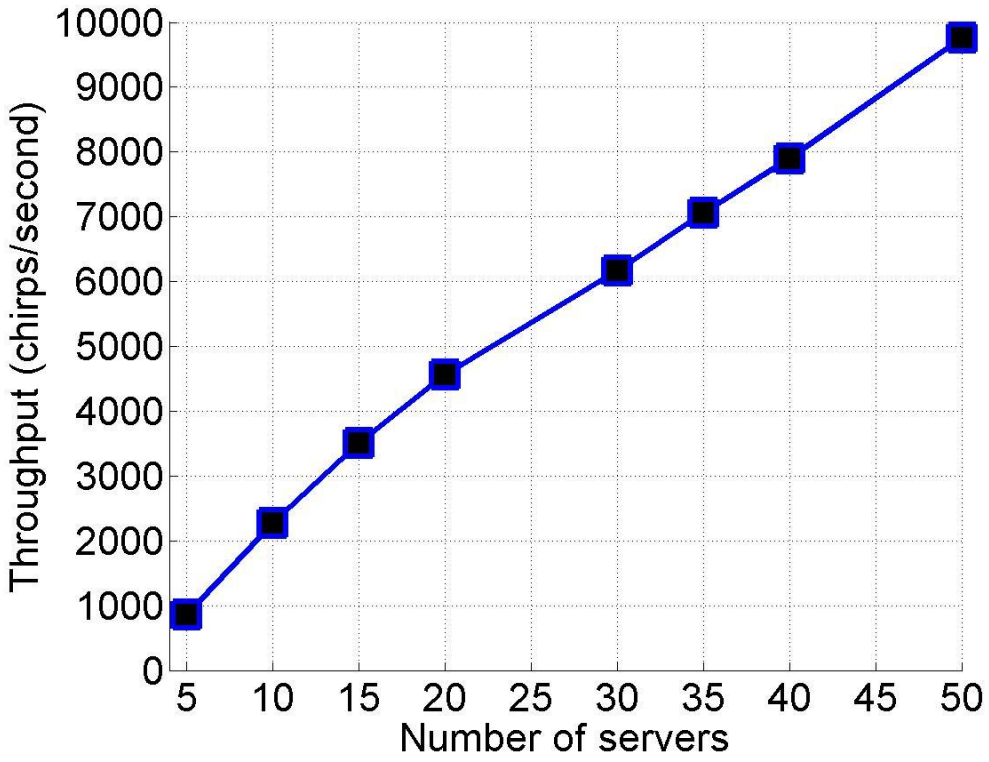


Applications and Grain Size

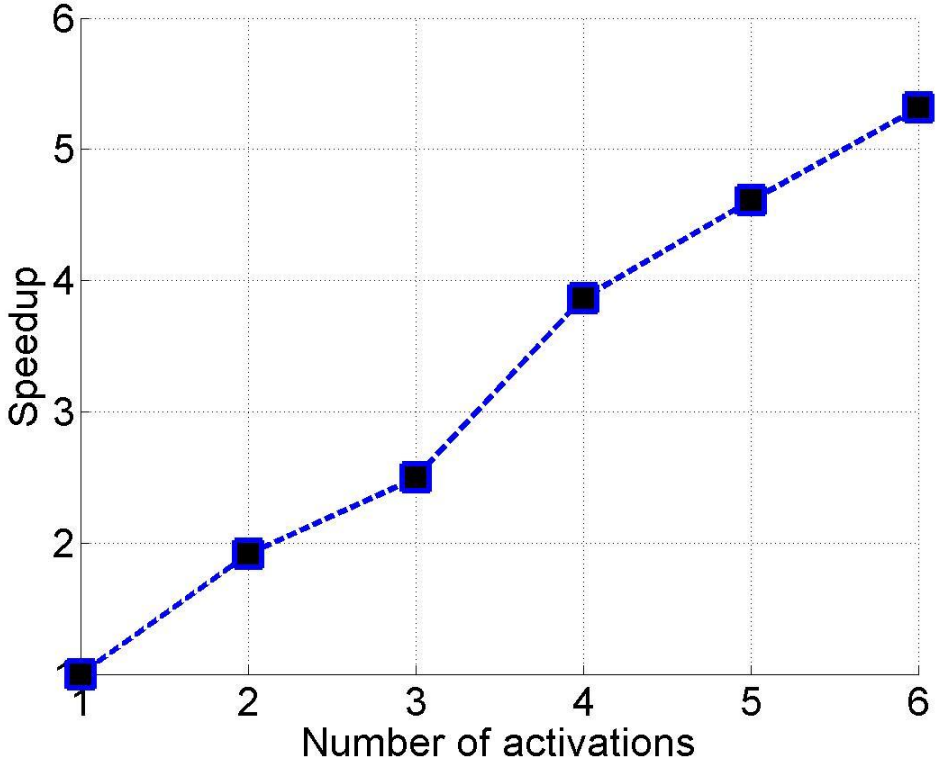


Evaluation

Total Chirper Throughput



Throughput of a Heavy Subscriber



- 200 lines of code
- Near linear scalability

Related Work

- Actor models
  - Erlang
  - E
  - Thorn
- Distributed Objects
  - EJB
  - CORBA
- Transactions
- Futures/Promises
  - [Liskov et al]
- Conflict resolution
  - CRDTs [Marc Shapiro]
  - Concurrent Revisions [Burckhardt & Leijen]

Conclusion

Orleans = Programming Model + Distributed Runtime

- Simplified Programming Model
- Transparent Scalability
- Adaptive Performance Tuning

Make cloud programming accessible to everyone!