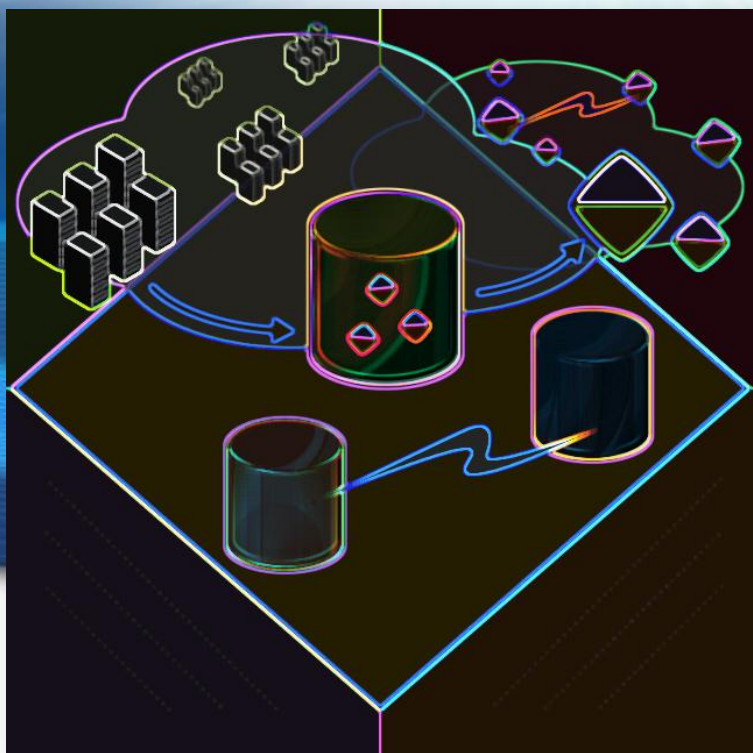


EXTREME COMPUTING GROUP



Defining the future.

Orleans: Cloud Computing for Everyone

Sergey Bykov, Alan Geller, **Gabriel Kliot**, James Larus, Ravi Pandya, Jorgen Thelin
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

- Simplified Programming Model
- Transparent Scalability
- Adaptive Performance Management

.NET + Azure

Grains

Shopping Cart Grain

Behavior	State	
Buy(...)	Total Price	\$1300
Checkout(...)	Products	
	Customer	



Product X Grain

Behavior	State	
NumAvailable()	Name	"Canon EOS T3i"
Buy(...)	SKU	B004J3V90Y
	Quantity	12345
AddReview(...)	Price	\$800

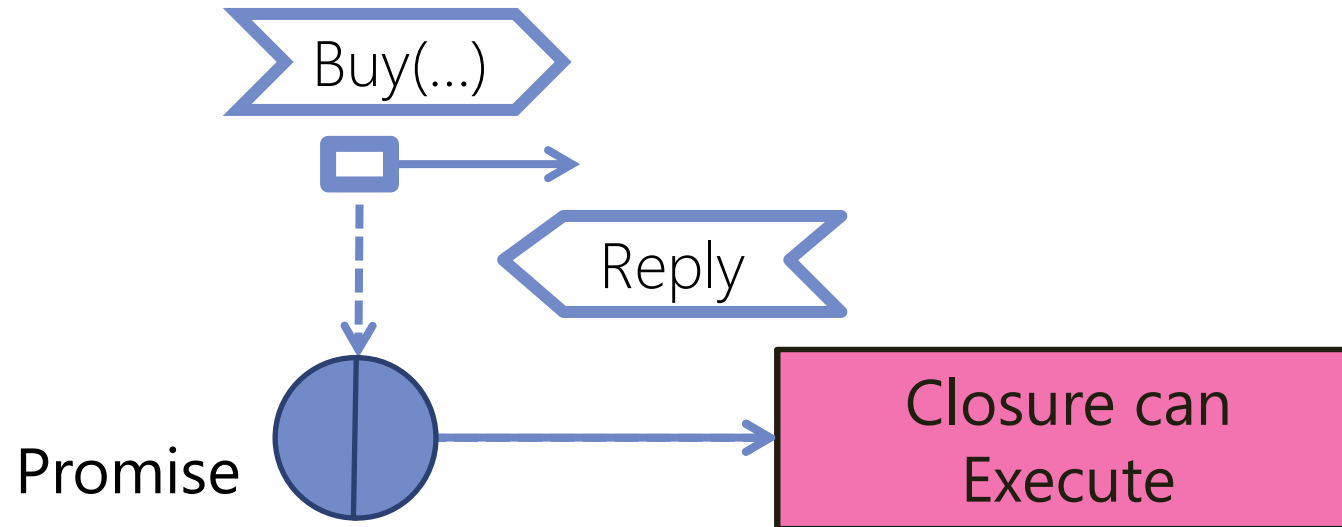
Customer Grain

Behavior	State	

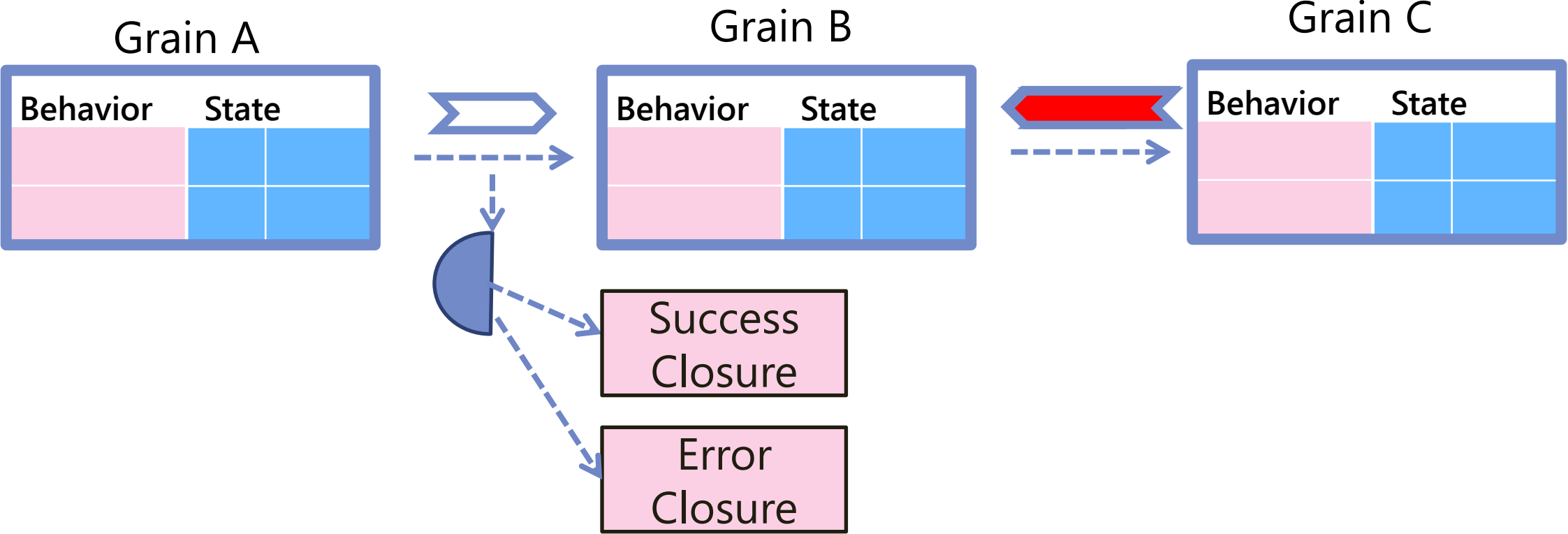
Product Y Grain

Behavior	State	
NumAvailable()	Name	"Sony TC412"
Buy(...)	SKU	X0322D12
	Quantity	315
AddReview(...)	Price	\$500

Asynchronous Communication and Promises

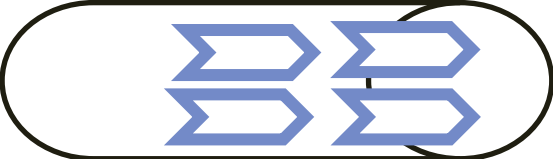


Simplified Error Handling

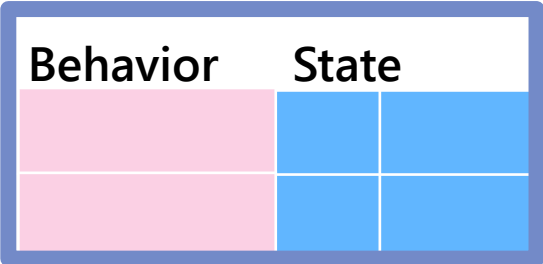


Single Threaded Execution Model

Message Queue



Grain A

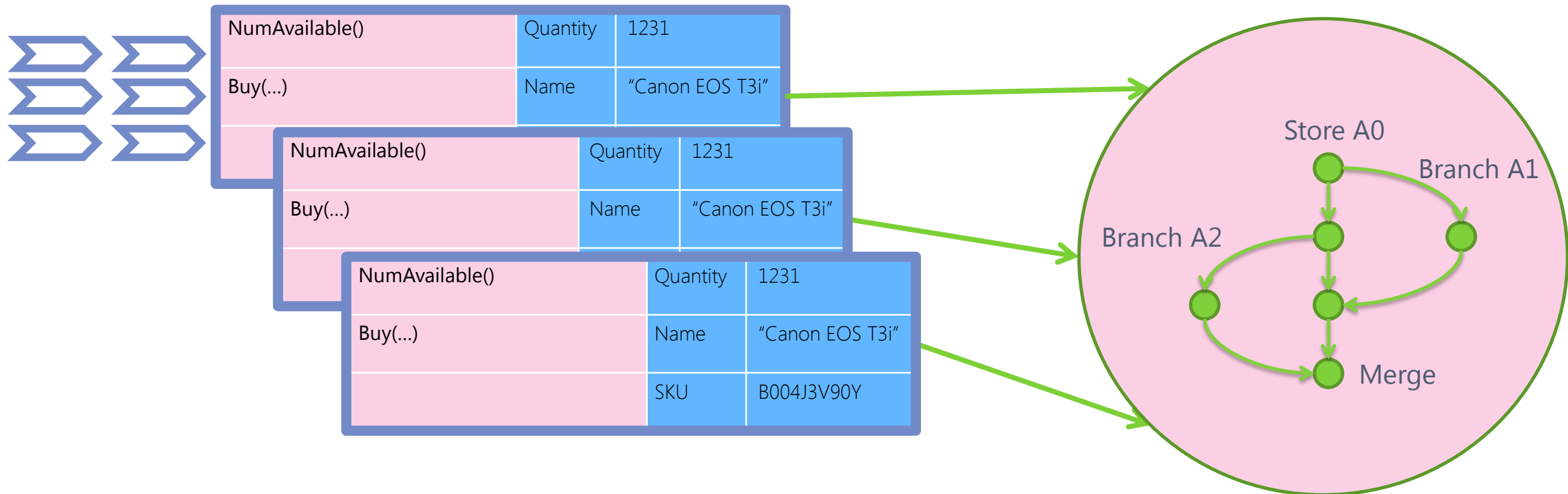


Execution Queue

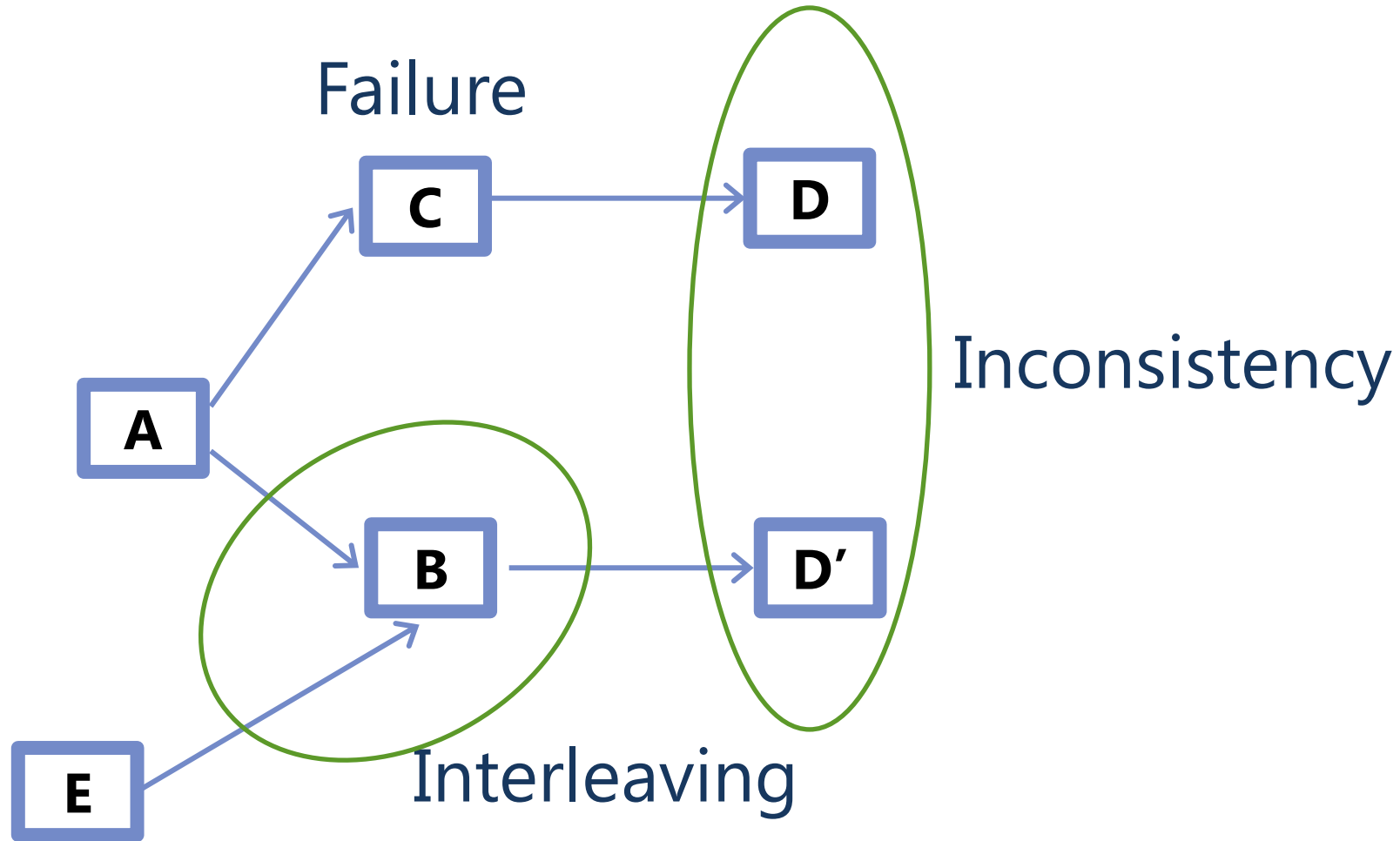


Activations

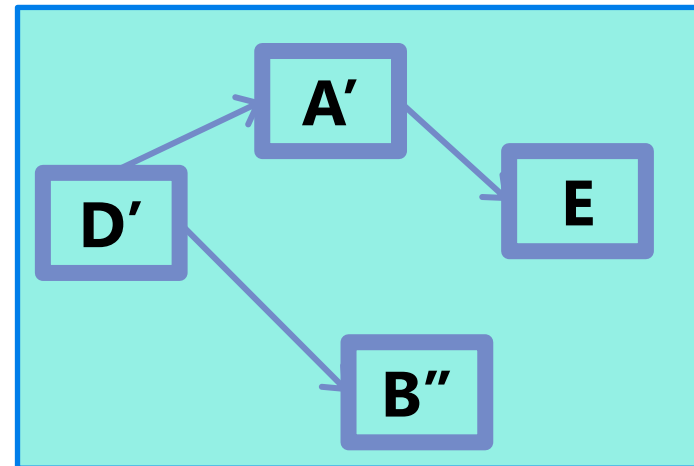
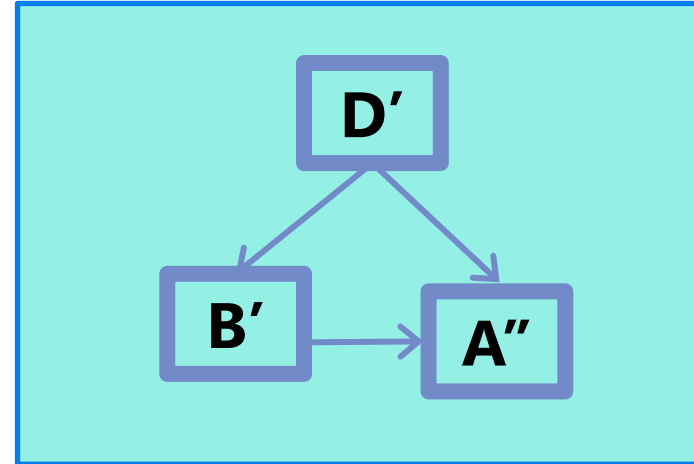
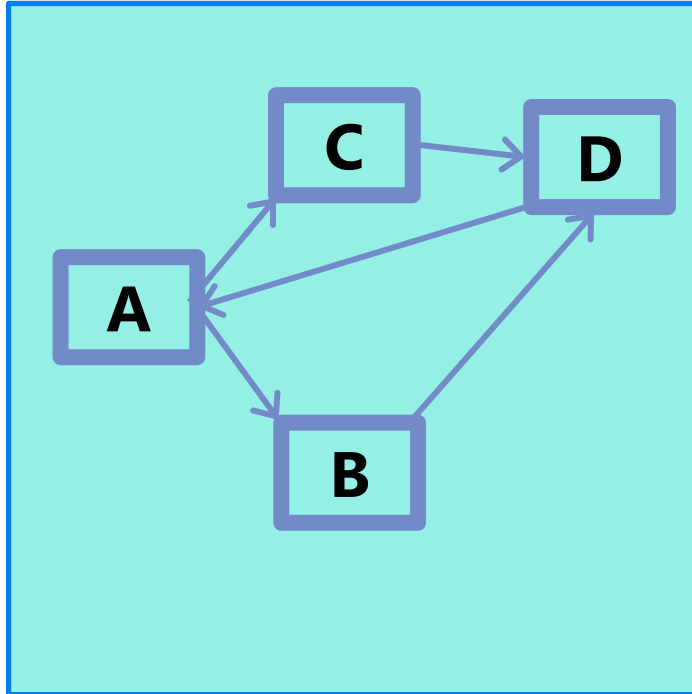
State Reconciliation



What could go wrong?

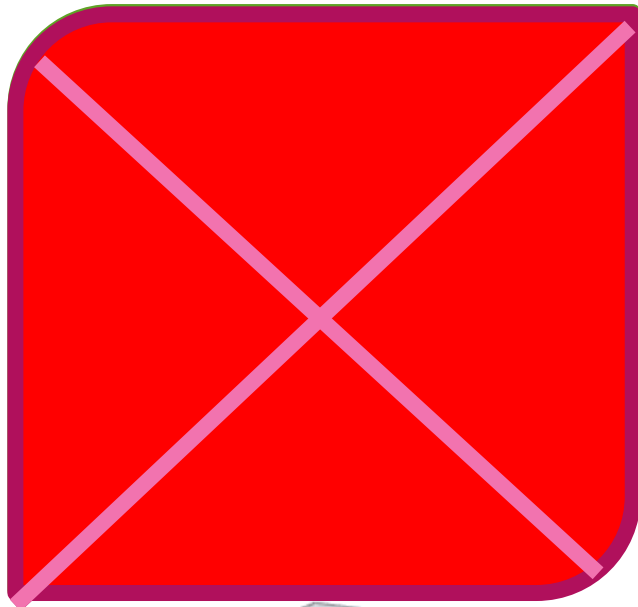


Lightweight Transactions

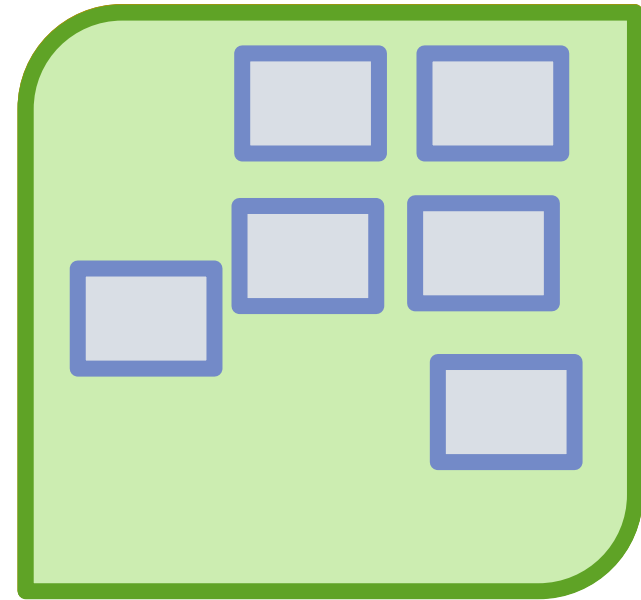


Adaptive Runtime

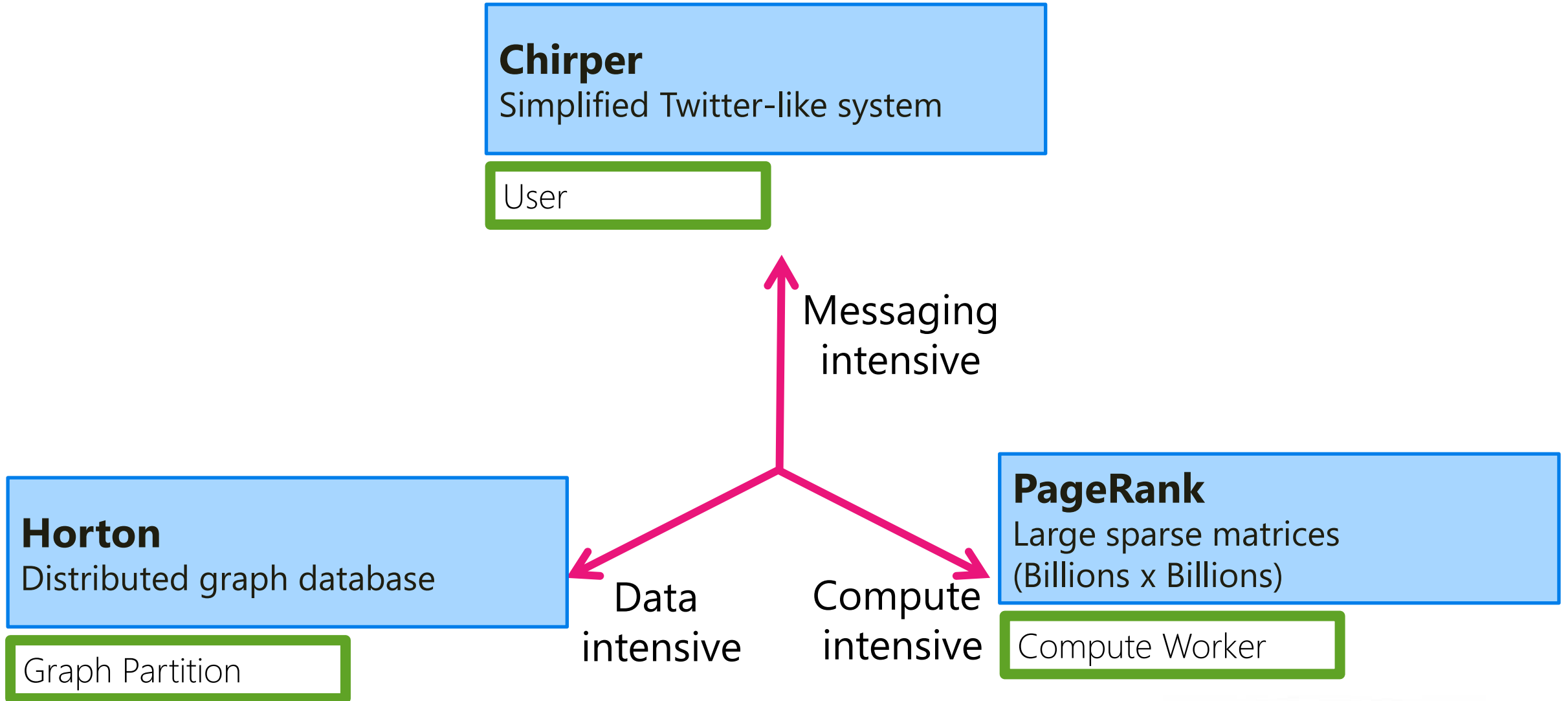
Silo



Silo

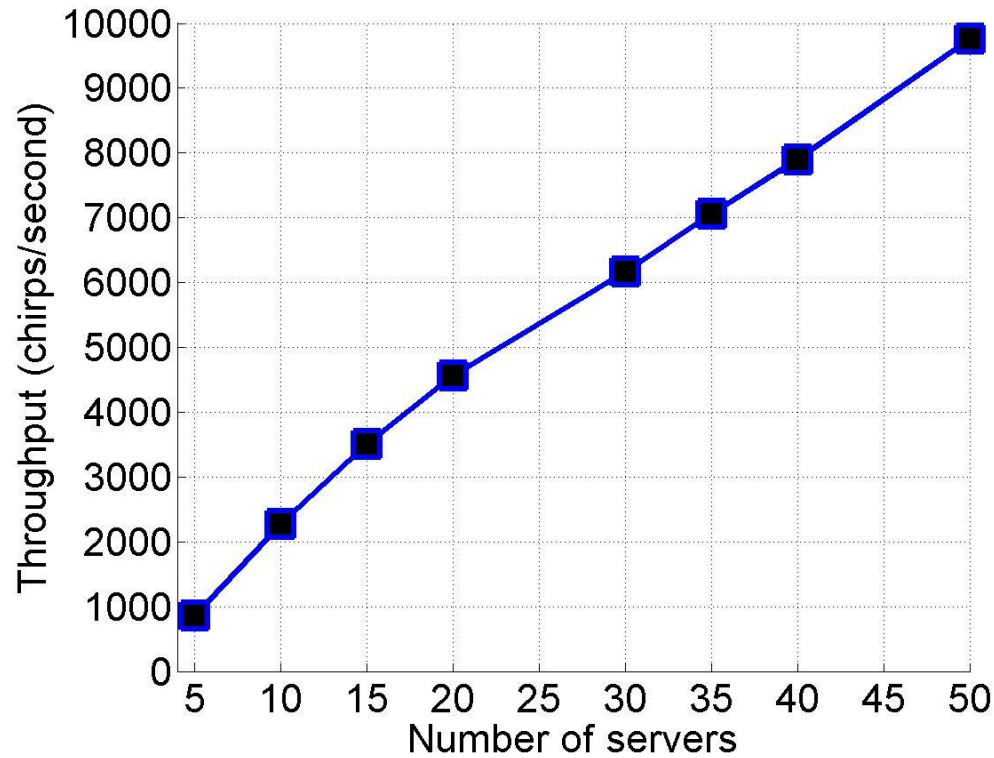


Applications and Grain Size

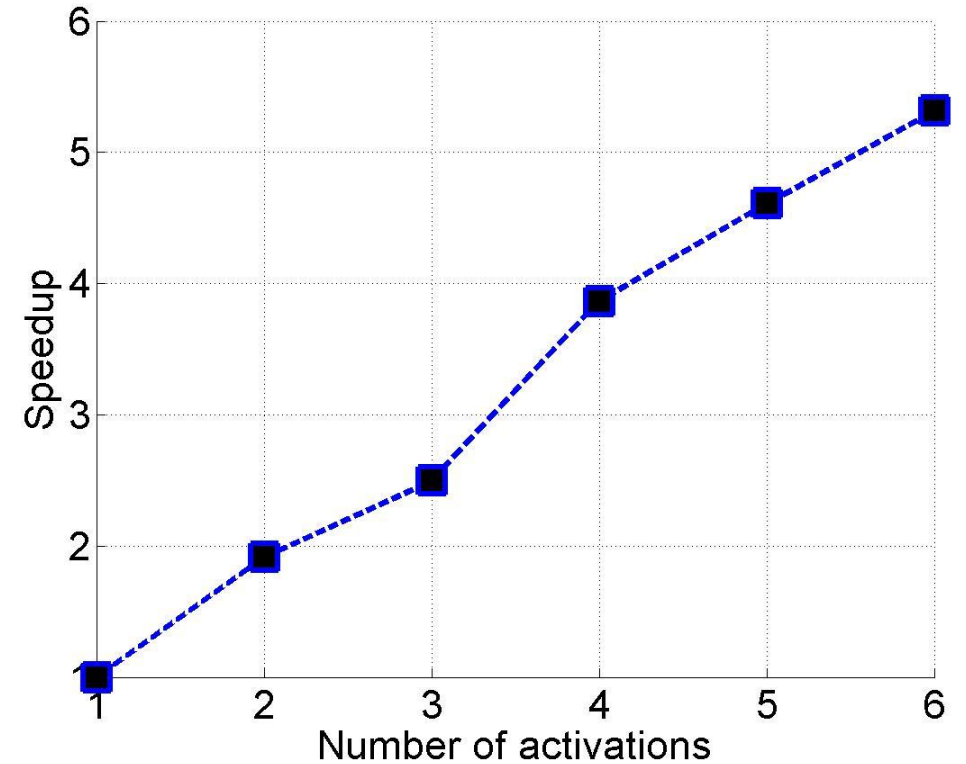


Evaluation

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!**