A Real-time Settlement System for Multiple Internet Services

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Introduction

- Internet Services Opportunity Deja Vu
- Settlement Business Model
- Common Processing Requirements
- Deployment and Scalability Constraints
- Technology Choices
- Implementation Results
- Summary

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Do You Remember When?

- Cisco traded at over $60 a share?
- Dot com IPOs were swarming?
- Highway 237 was a parking lot?
- Bits were more valuable than atoms?
- The Internet was exploding?

Here's what the pundits were saying…

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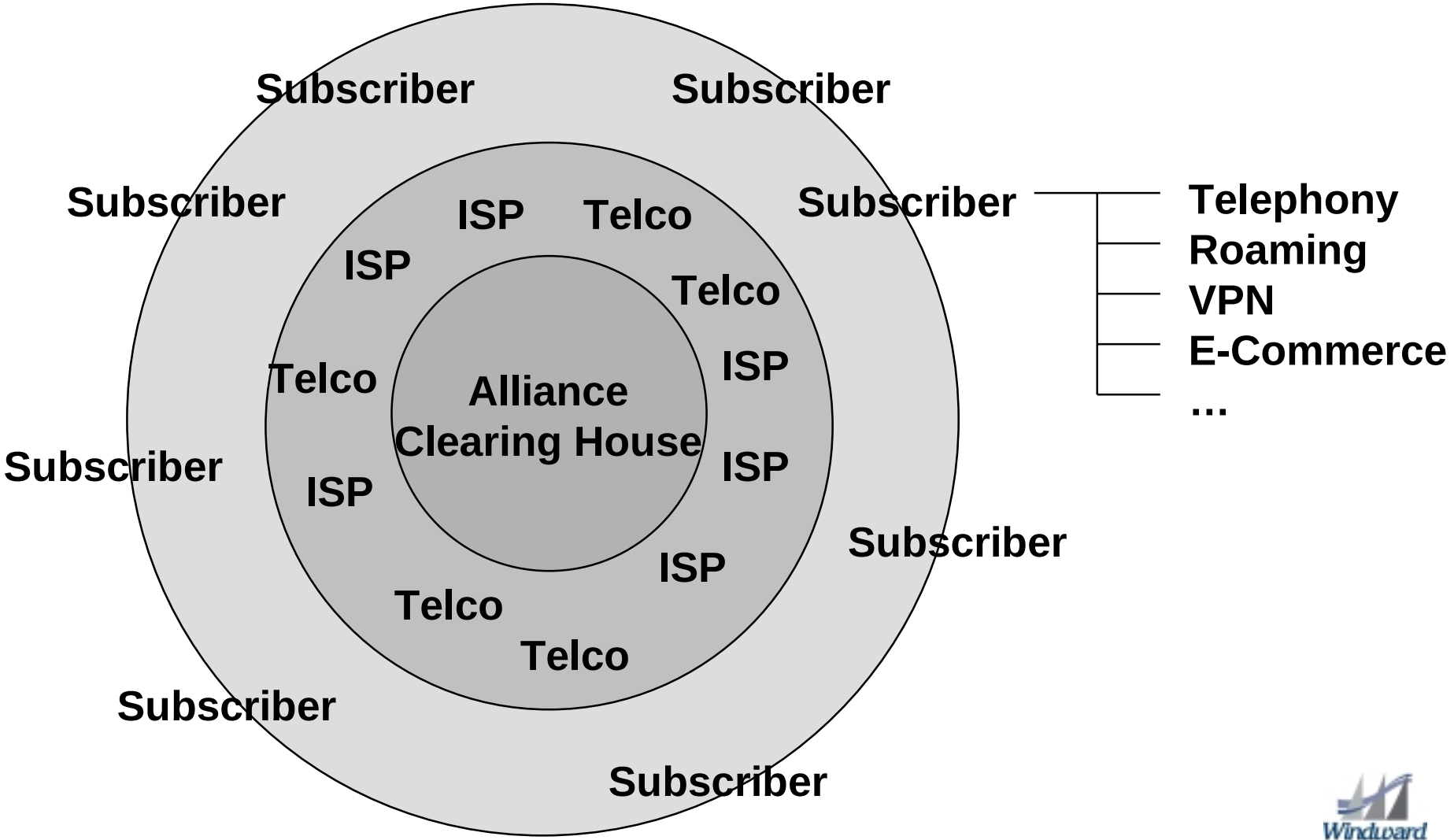
IP Service Growth Projections 1998 -> 2004

- Global internet remote services
  - Roaming minutes: 87.1M -> 62.9B **722x**
  - Revenue (USD): 16.8M -> 5.5B **327x**
- Internet telephony market
  - Voice minutes: 310M -> 135B **435x**
  - Revenue (USD): 100M -> 19B **190x**
- 2.5G Mobile commerce market
  - Subscribers: 1.2M -> 81.3M **68x**
  - Revenue (USD): 520M -> 30.4B **58x**

1) Frost & Sullivan - 1999
2) IDC – 1999
3) Datamonitor - 2000

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A Worldwide Alliance Network



The IP Service Network Opportunity Was…

- Service providers had:
  - Regional networks
  - Limited IP-based services
  - Independent authentication mechanisms
  - Independent billing systems
- End users wanted
  - Seamless global access
  - Multiple IP-based services
  - Single password
  - Single bill

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Multiple IP-based Services

- Business to Consumer
  - Access to content
  - Customer relationships
  - Workforce automation
- Consumer to Consumer
  - Email / Messaging / Chat
  - Voice / Fax / Conferencing
  - Music / Video / Gaming
- Business to Business
  - Supply Chain
  - Logistics

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What IP Service Providers Needed

- Global footprint to compete with global ISPs
- New services to differentiate themselves
- New sources of revenue to grow
- Lower costs for profitability
- Expanding customer base

Settlement Clearinghouse (*n*): An independently managed platform of common technology, service and payment standards

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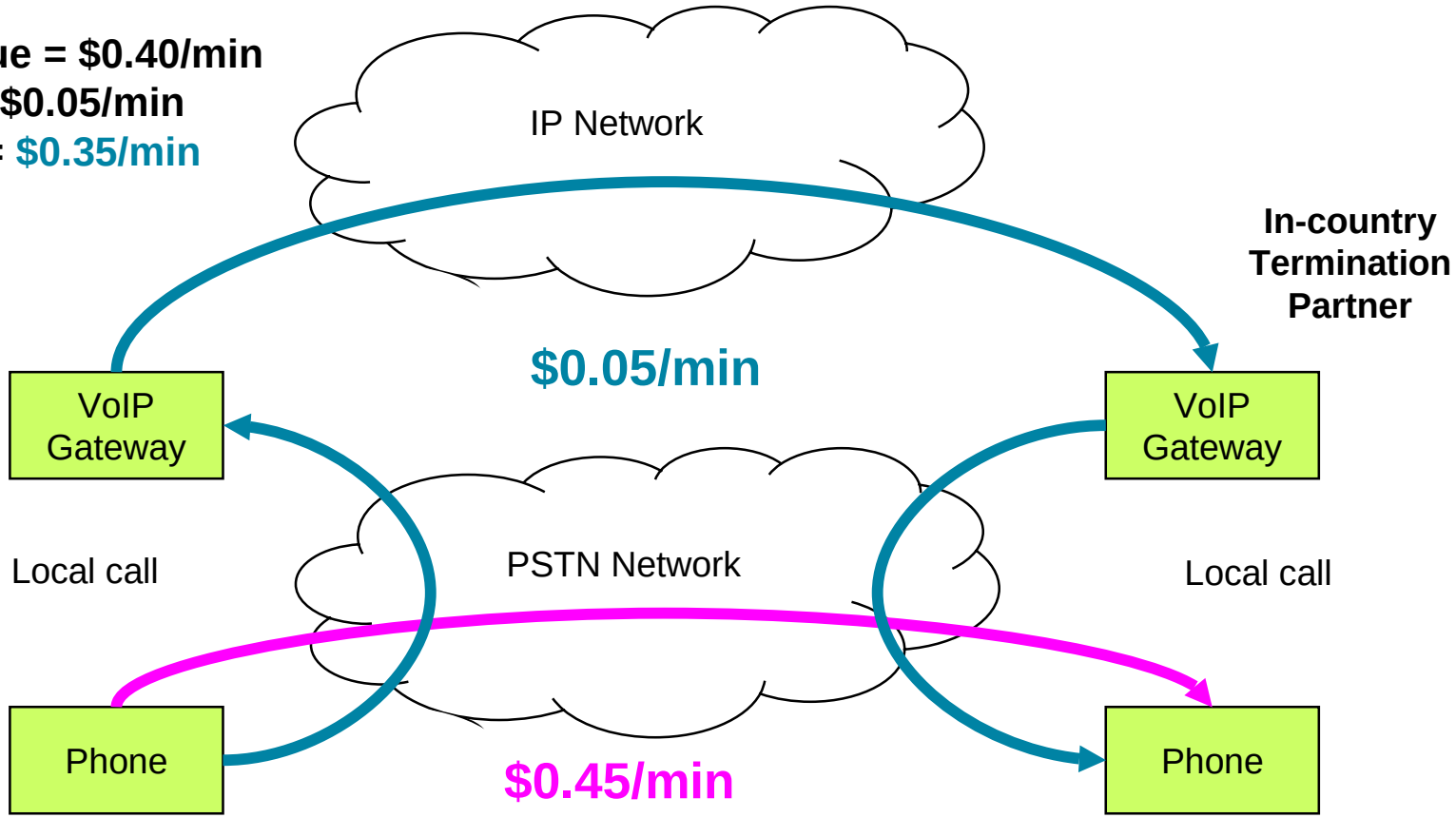
Settlement Business Model

- Federated service providers
- Multiple service types
- Multiple service delivery locations
- Multiple currencies
- Service level agreements
- Recurring transactional revenue

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Example: VoIP Tariff Arbitrage

Revenue = $0.40/min
Cost = $0.05/min
Profit = $0.35/min



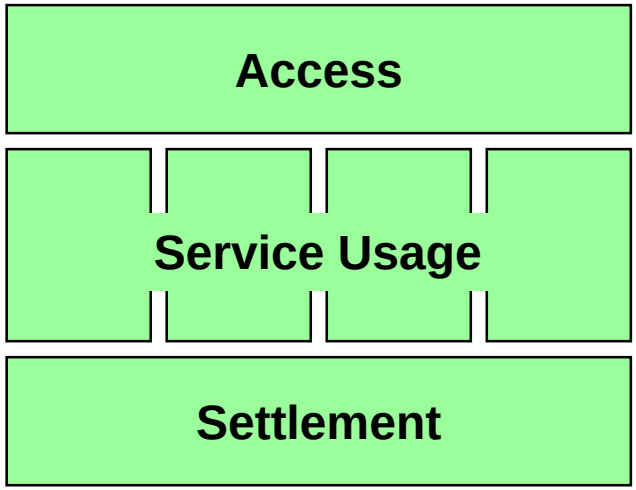
Let's Build: An Internet OSS

- Network management
  - Quality of service
  - Route termination
  - Access control
- Provisioning
  - Roaming
  - VoIP
  - Messaging
- Settlement
  - Usage collection
  - Clearing

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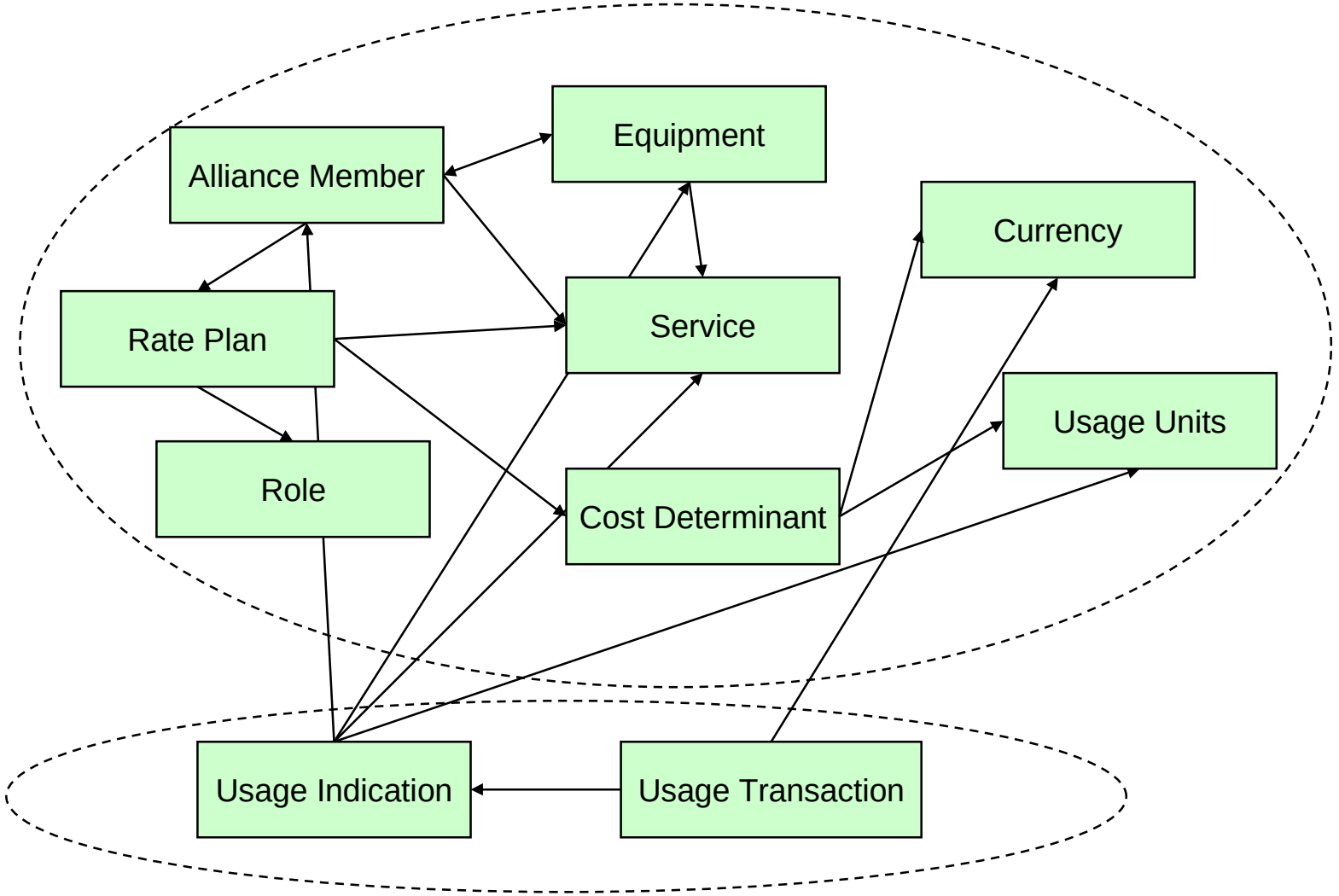
Common Processing Requirements

- Authentication
- Authorization
- Routing
- Usage collection
- Filtering & correlation
- Usage rating
- Settlement of accounts
- Billing and collection



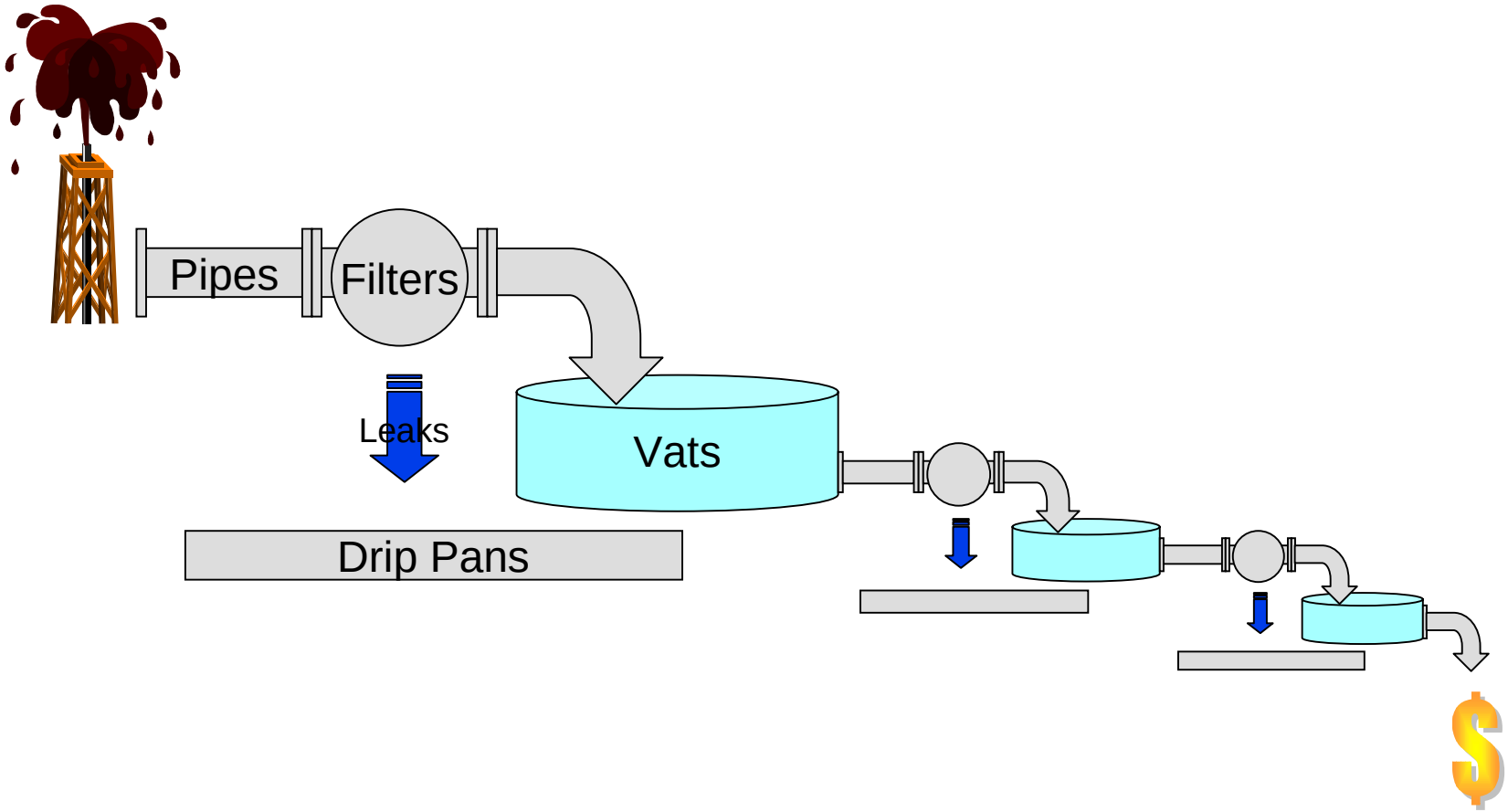
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Common Domain Objects

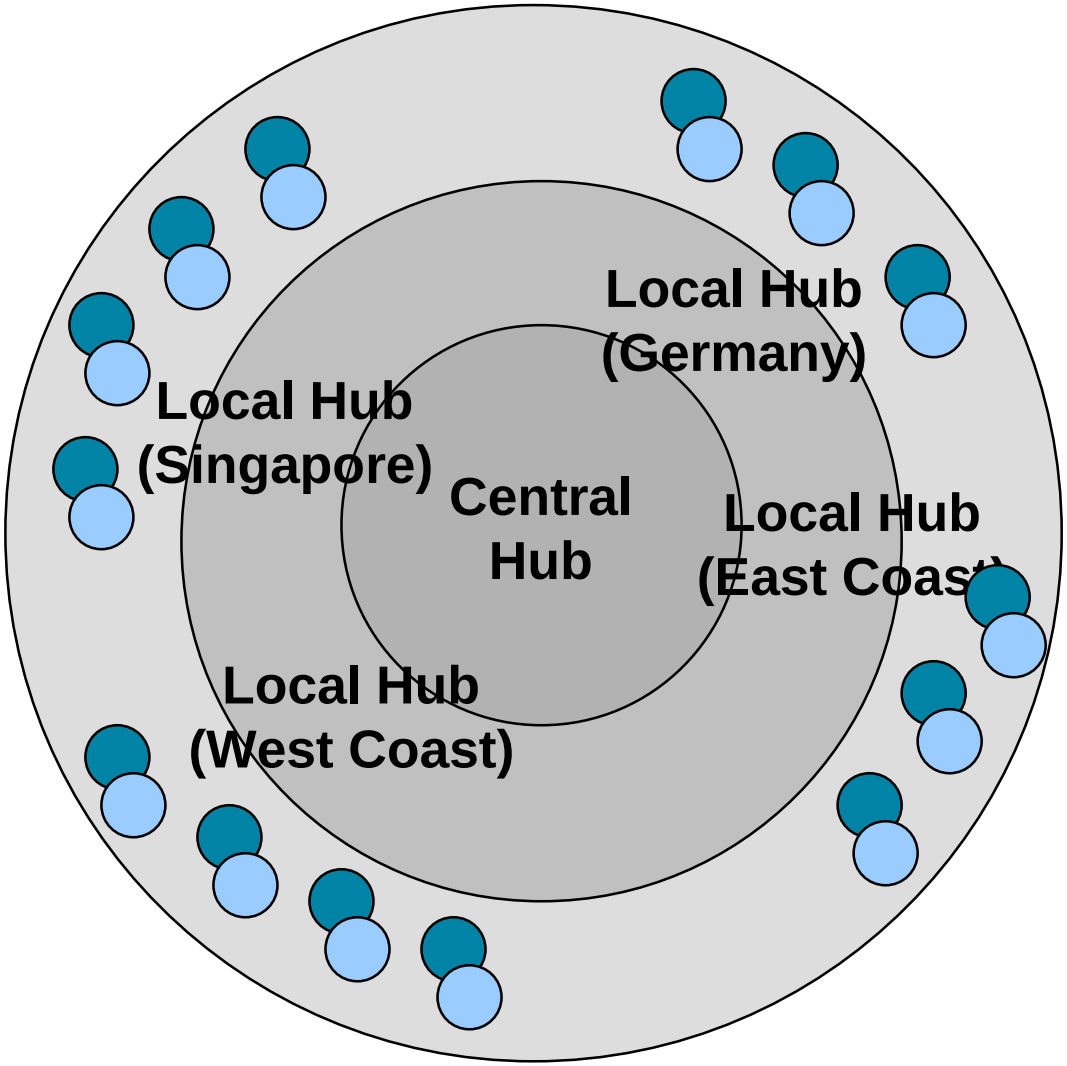


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Usage Pipeline Metaphor



Global Service Deployment



Remote Access
VoIP

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Deployment and Scalability Constraints

- World wide user population
- Speed of light latency limits
- High volume of small usage indications
- Duplicate and fraudulent usage indications
- Hostile Internet environment
- 24x7 reliability expected
- Same day service reporting

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Implementation Constraints

- Business processes
- Software product lifecycle
- Schedule expectations
- Engineering expertise
- Backward compatibility
- Investment limits
- People factors

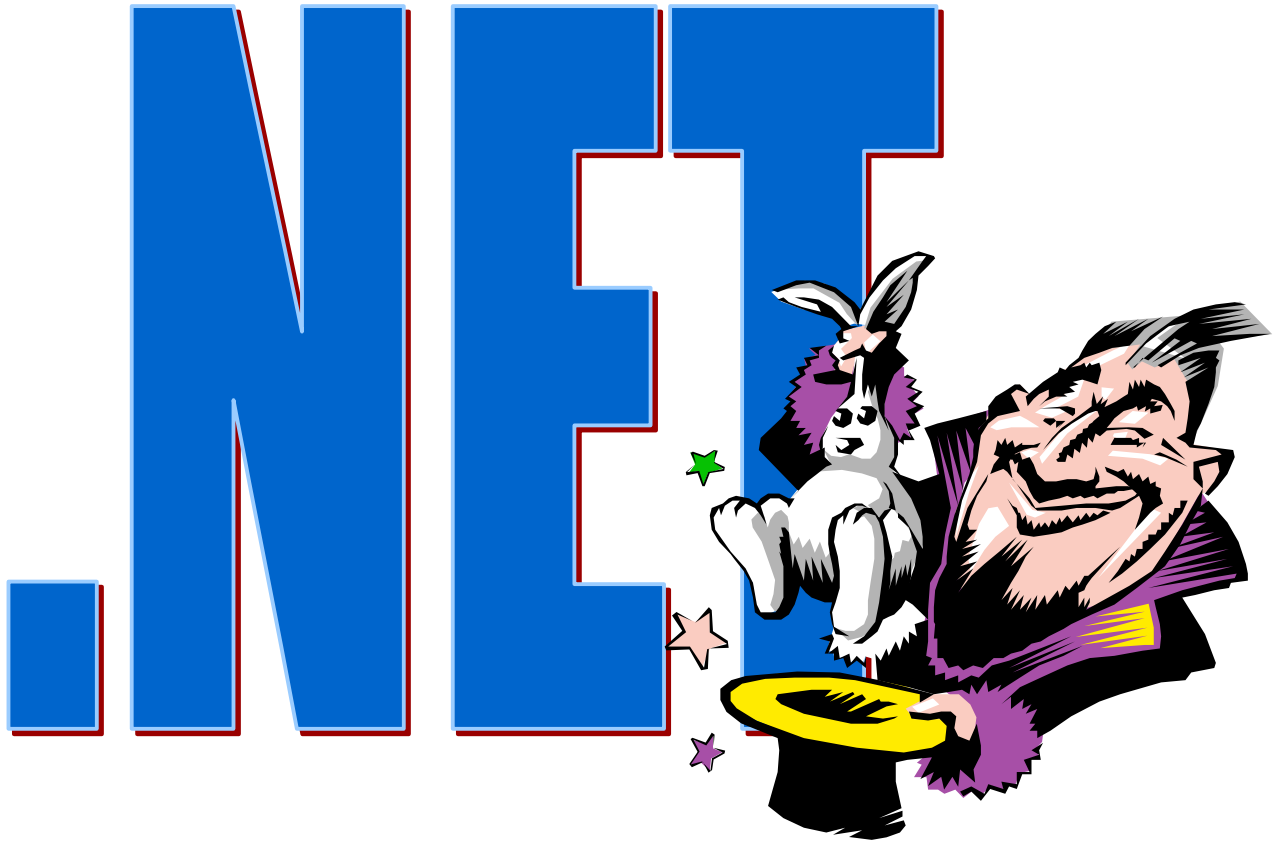
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Technology Choices

- Programming languages
- Databases
- Communication protocols
- Distribution infrastructure
- Deployment & monitoring

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Buy it all from Microsoft?



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Assemble it from Sun?

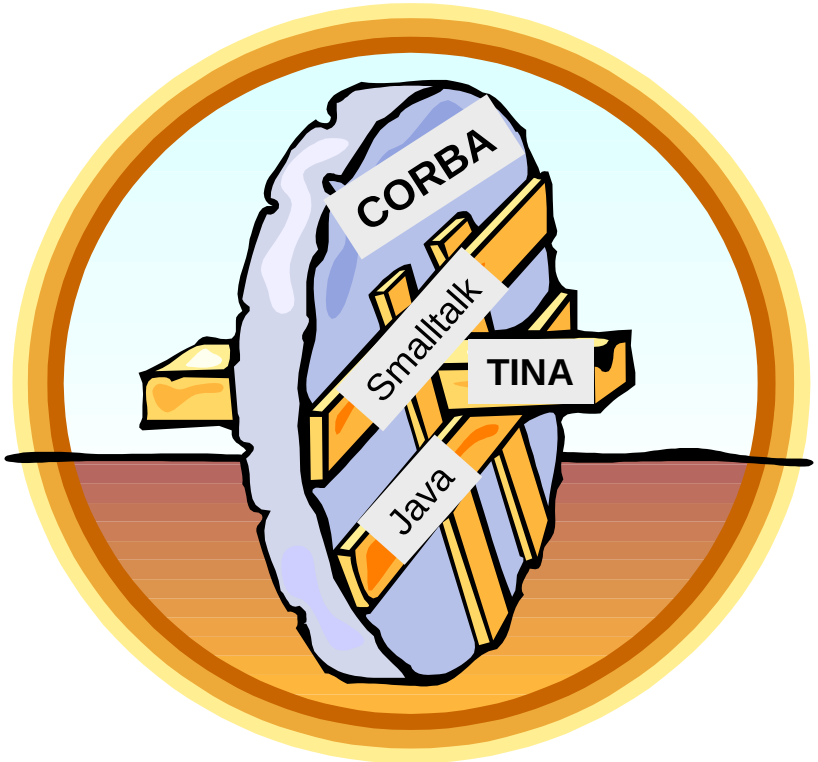
Java + Jini + Jiro+

JMX + EJB + JSP + …



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Build it Yourself?

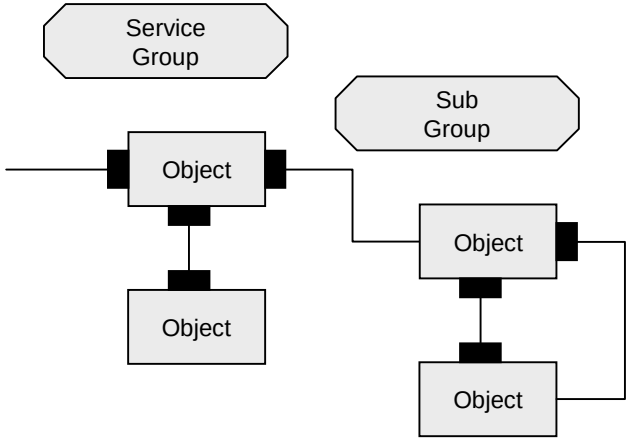


Aero™

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Aero™ Component Object Model*

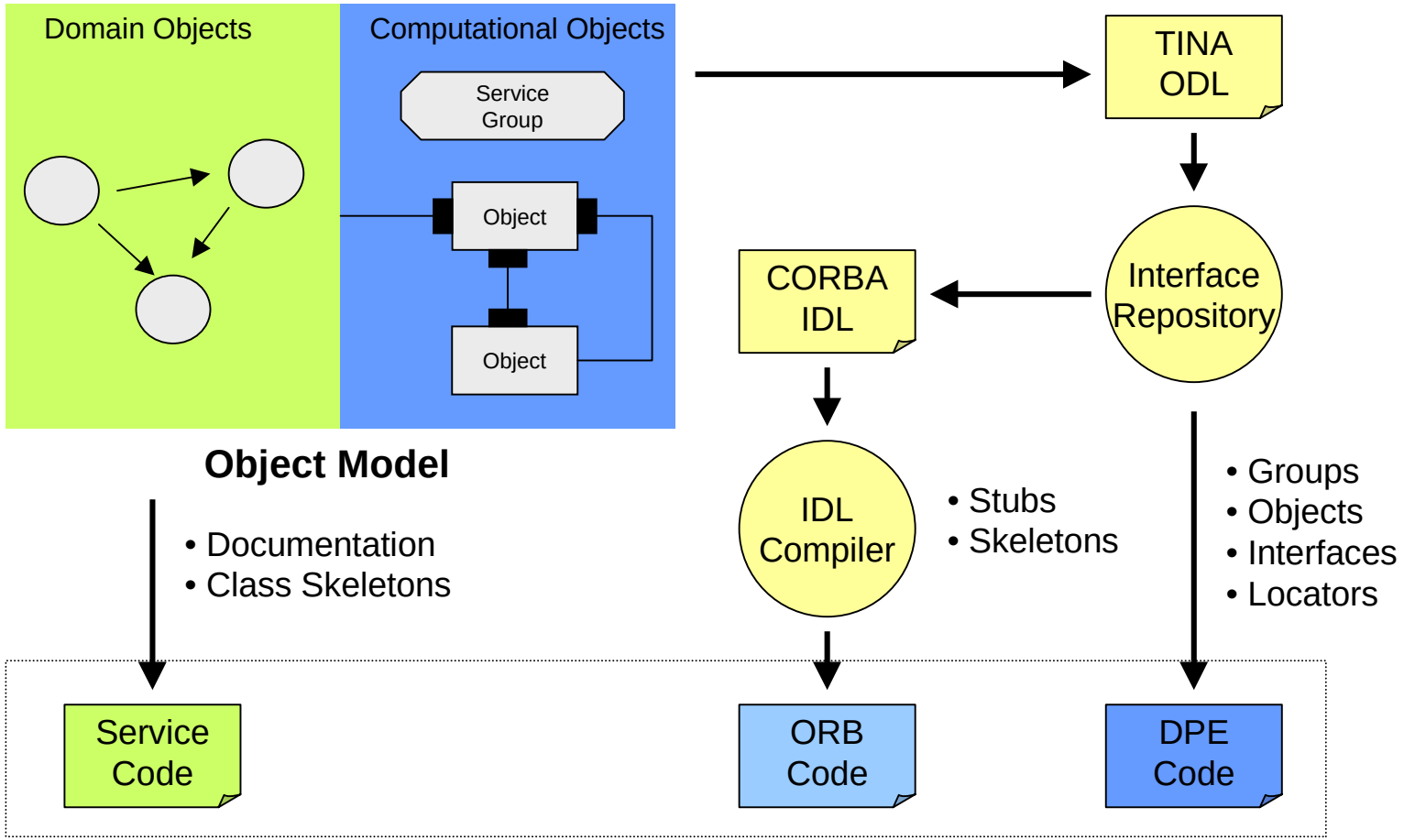
- Logical definition
  - *groups*
  - *objects*
  - *interfaces*
- Groups provide
  - trading to introduce objects
  - component object lifecycle
- Objects provide
  - multiple interfaces
  - interface dependency management
- Interfaces are OMG IDL



*** An implementation of**
Telecommunications Information Network Architecture Consortium (TINA-C) published standards

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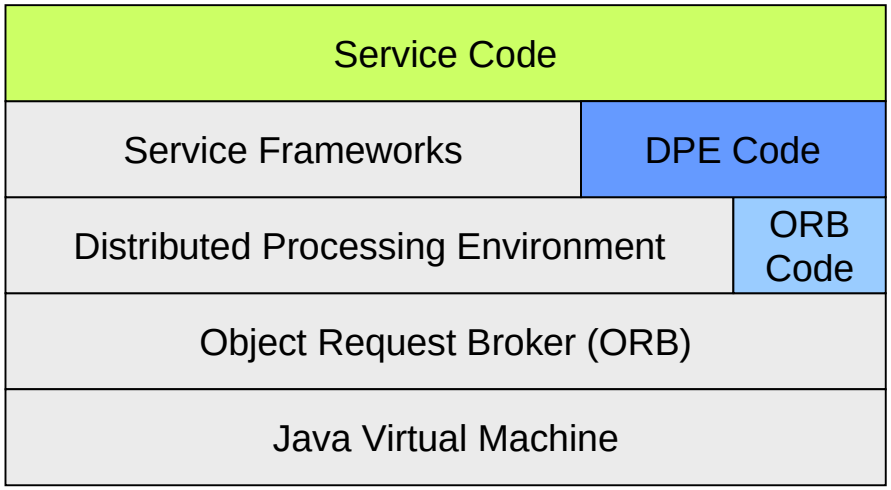
Aero™ Service Development Environment



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Target Deployment Platform

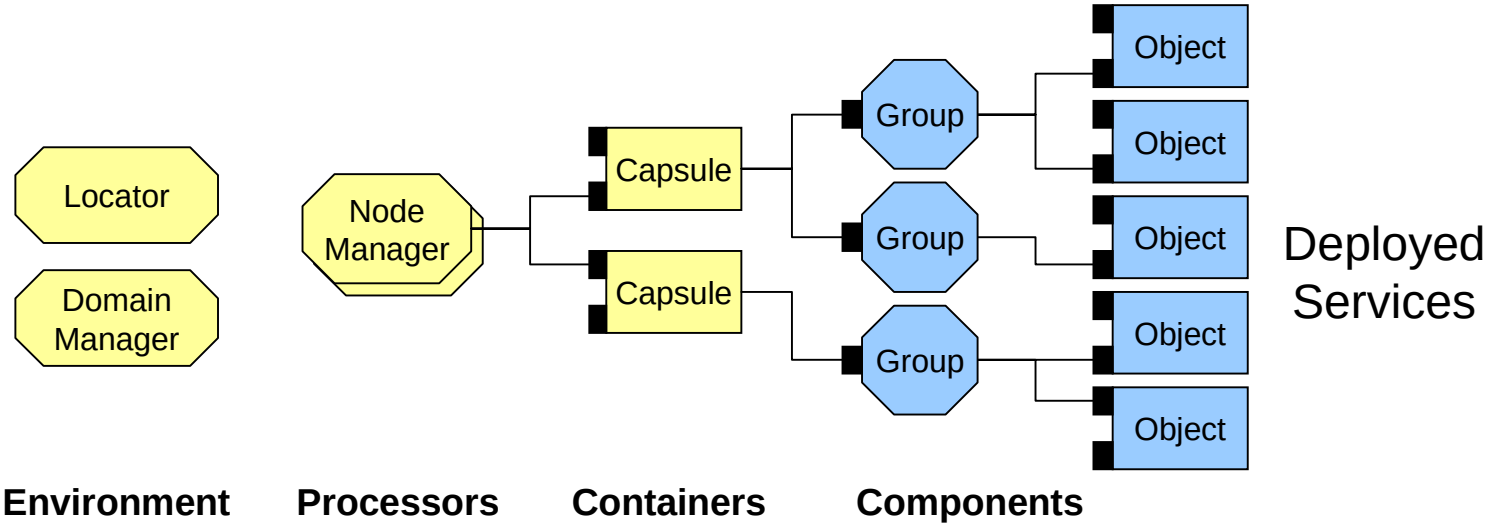
- Java for portability, productivity
- CORBA for interoperability
- TINA for distributed processing environment



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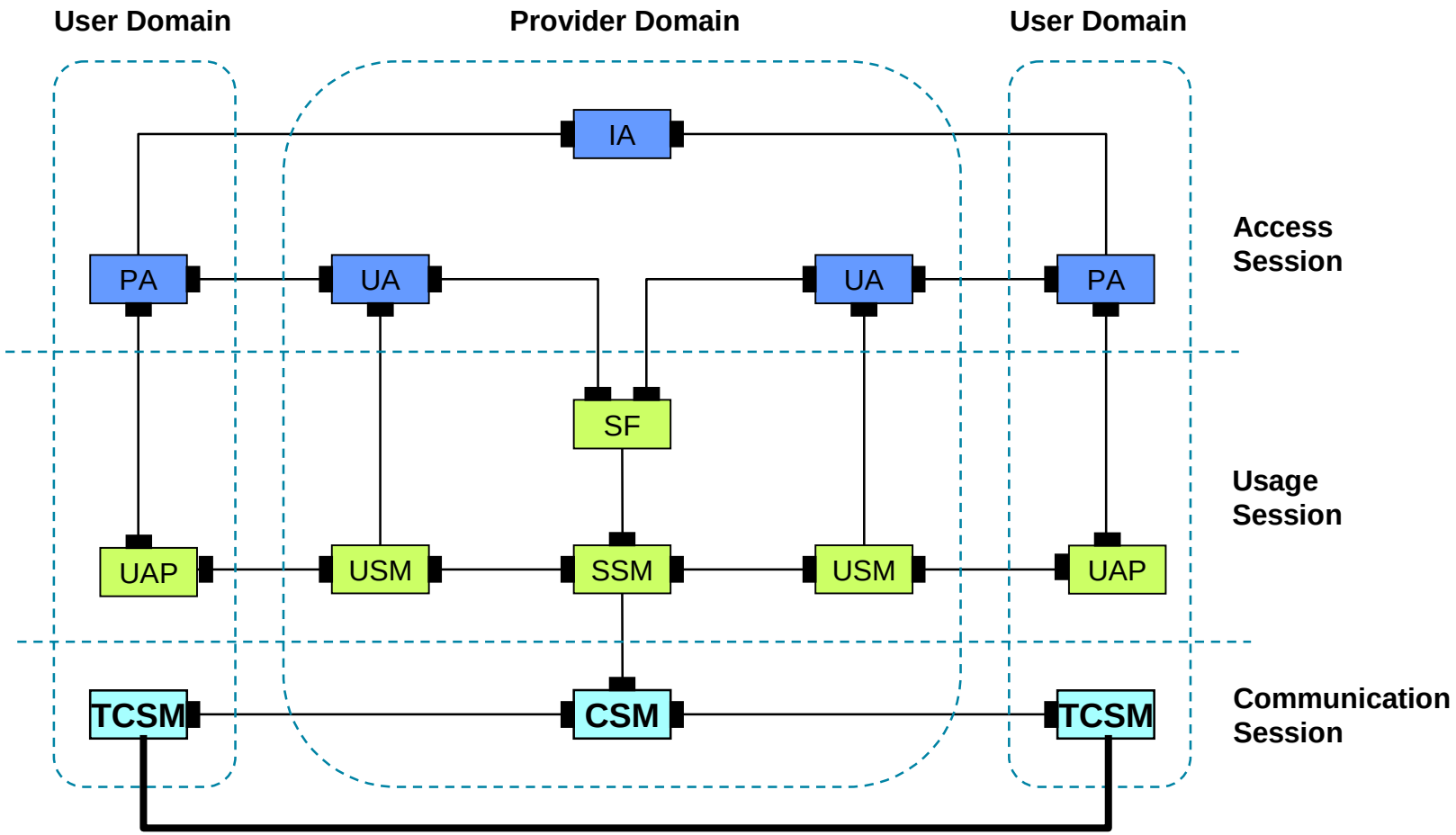
Distributed Processing Environment

- Domain Manager deploys service components
- Node Managers launch component capsules
- Domain Manager instantiates service groups
- Locator & groups provide trading introduction context
- Node Managers monitor & restart failed capsules



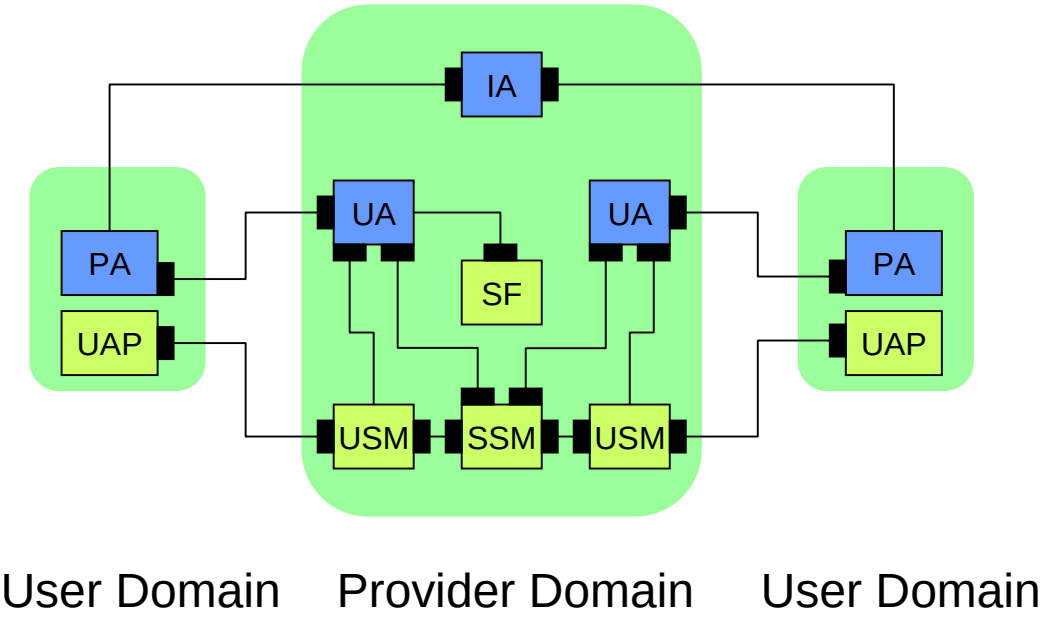
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TINA Service Architecture



Access Service Use Cases

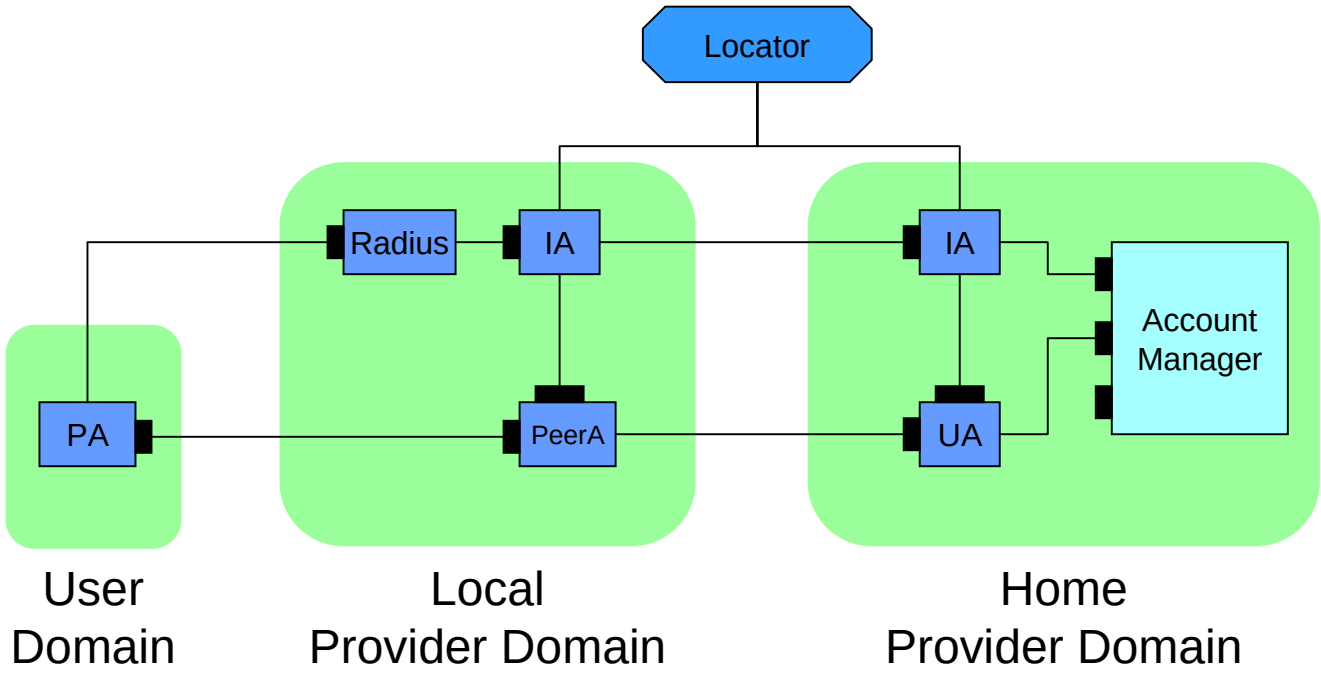
- Begin Access
- Begin Usage
- Invite User
- Join Service
- End Usage
- End Access



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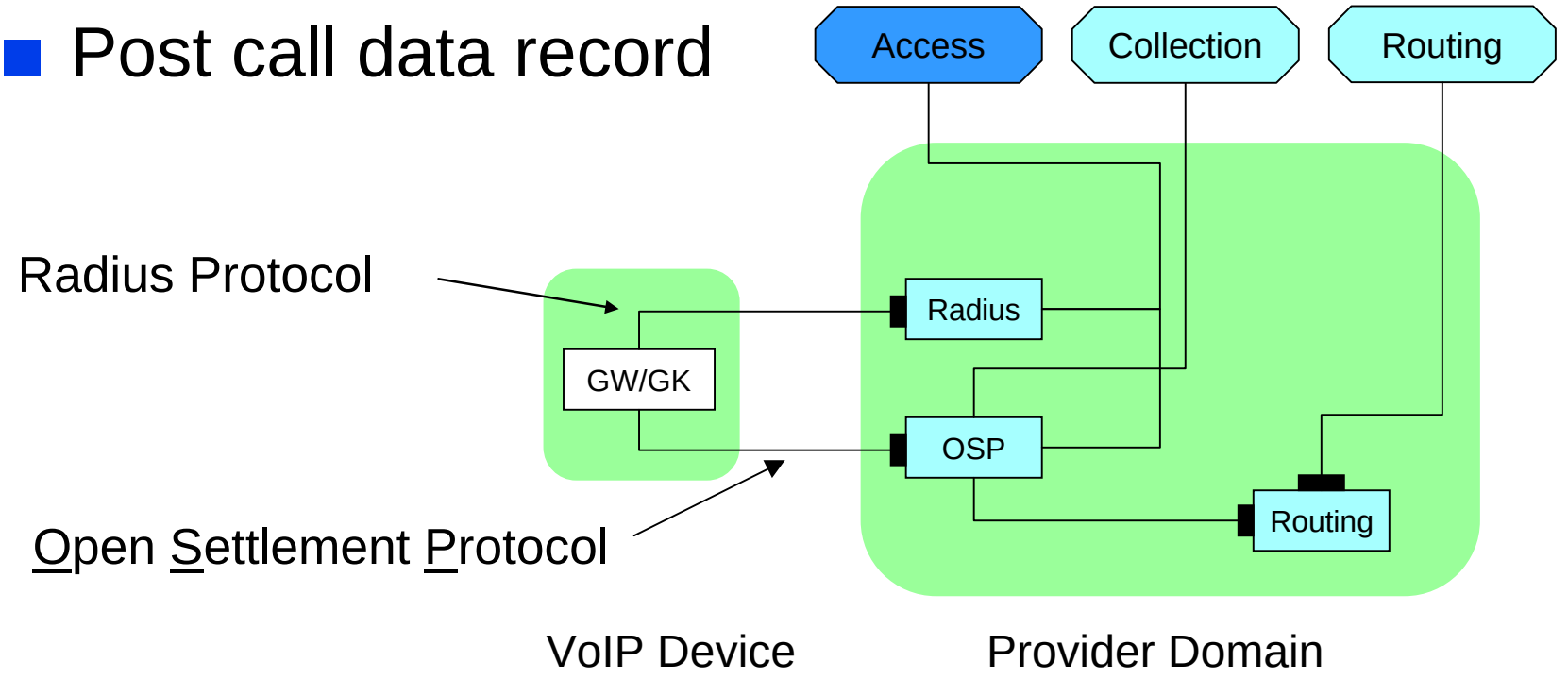
Roaming Access Use Cases

- User logs onto home domain
- User logs onto remote domain



VoIP Service Use Cases

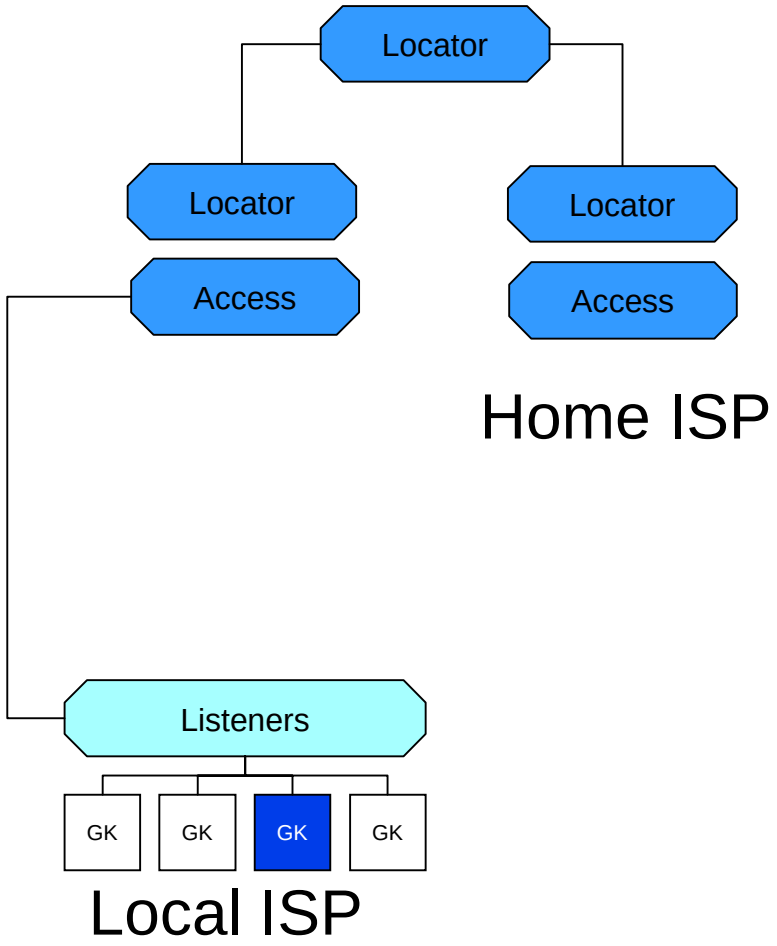
- Authorize user
- Terminate route
- Post call data record



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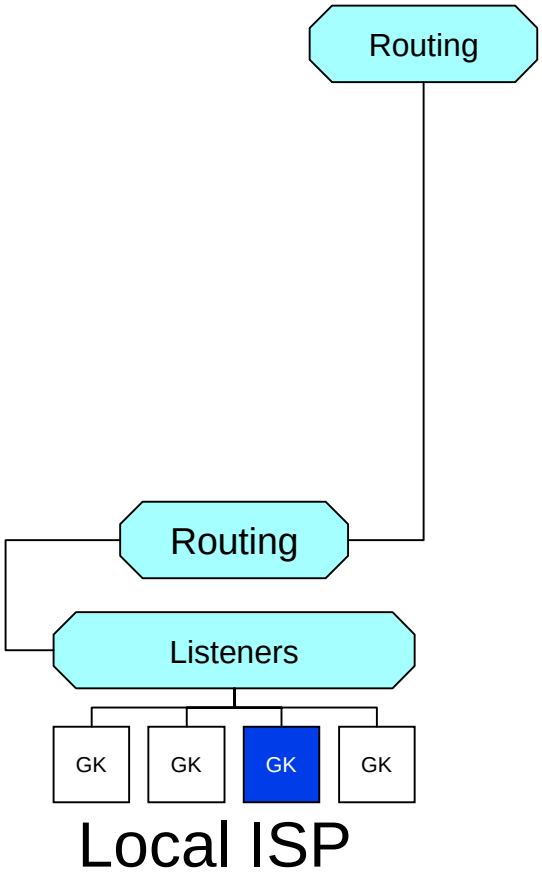
VoIP Processing Phases

- *Authentication*
- *Authorization*



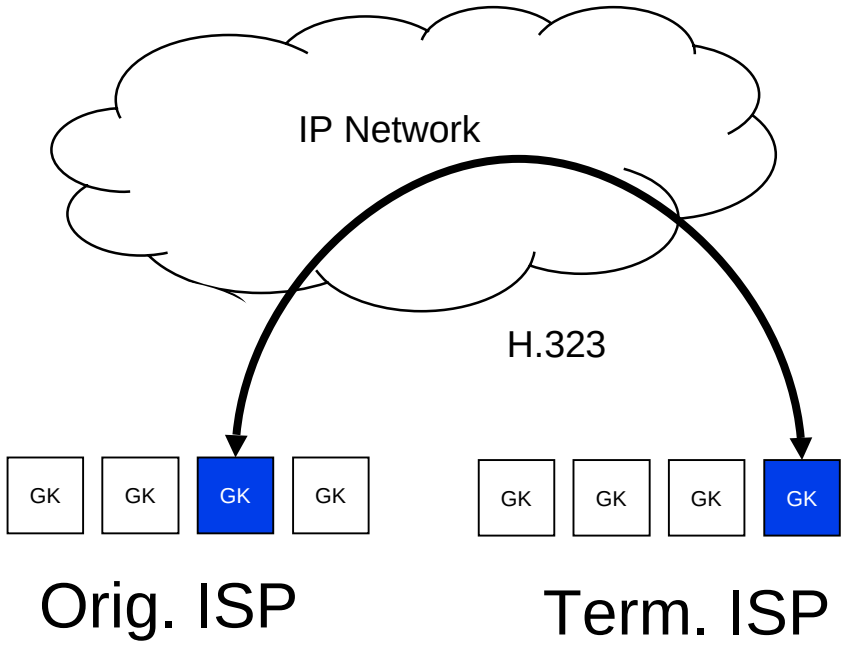
VoIP Processing Phases

- Authentication
- Authorization
- *Routing*



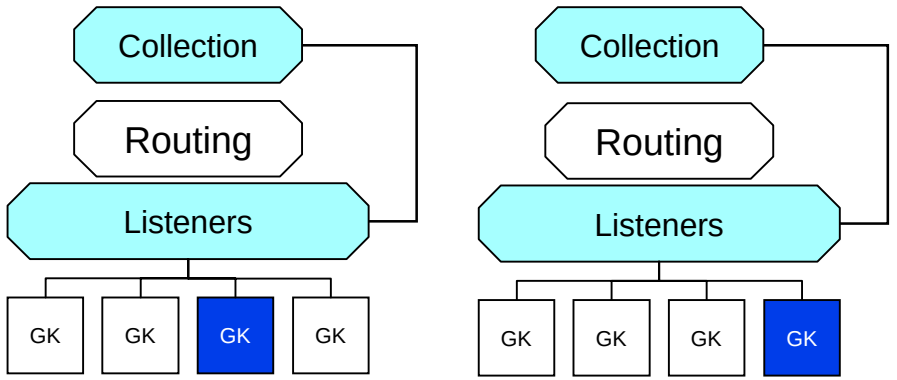
VoIP Processing Phases

- Authentication
- Authorization
- Routing
- Call Completion



VoIP Processing Phases

- Authentication
- Authorization
- Routing
- Call Completion
- Collection

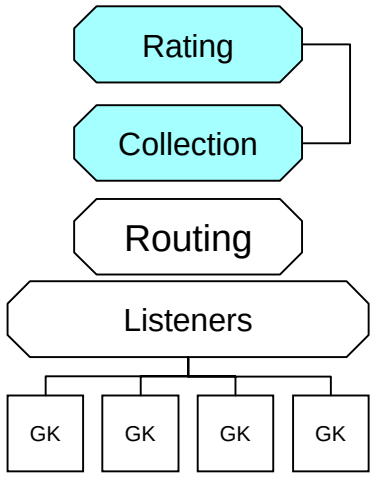


Orig. ISP

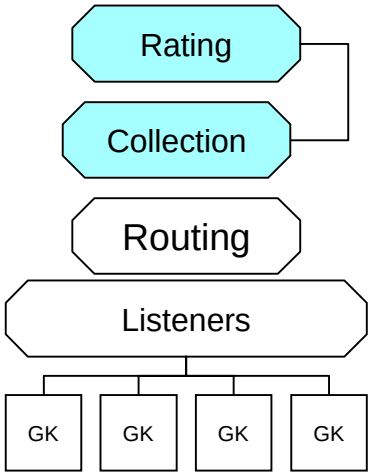
Term. ISP

VoIP Processing Phases

- Authentication
- Authorization
- Routing
- Call Completion
- Collection
- *Rating*



Orig. ISP

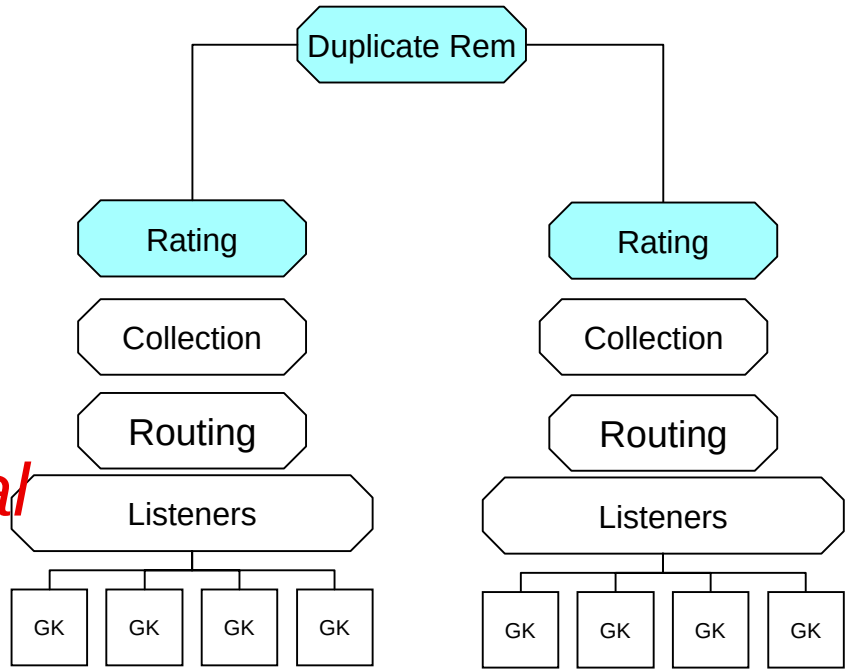


Term. ISP

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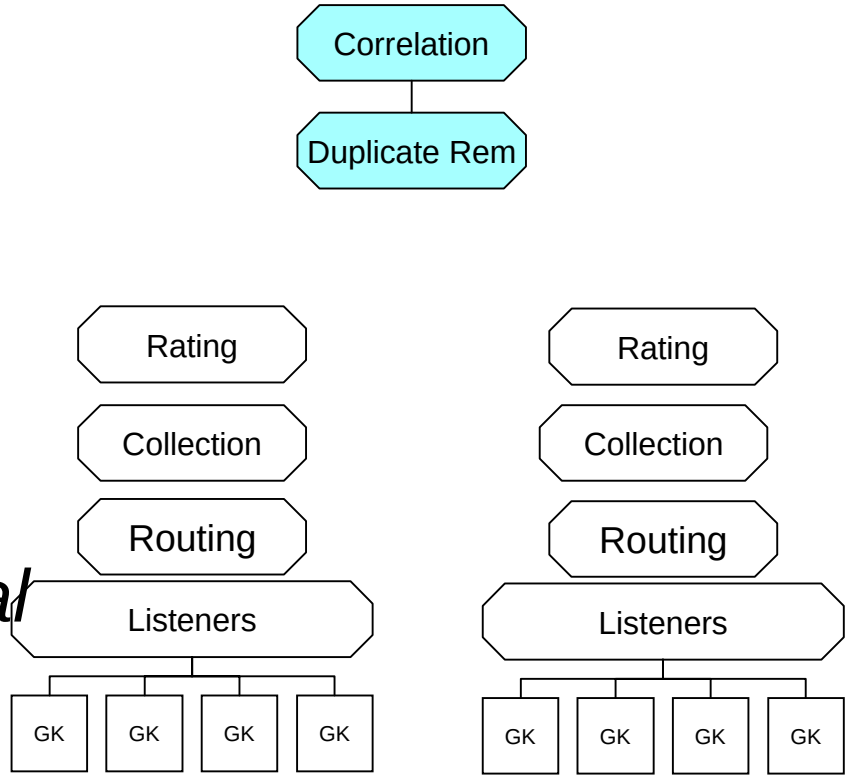
VoIP Processing Phases

- Authentication
- Authorization
- Routing
- Call Completion
- Collection
- Rating
- *Duplicate removal*

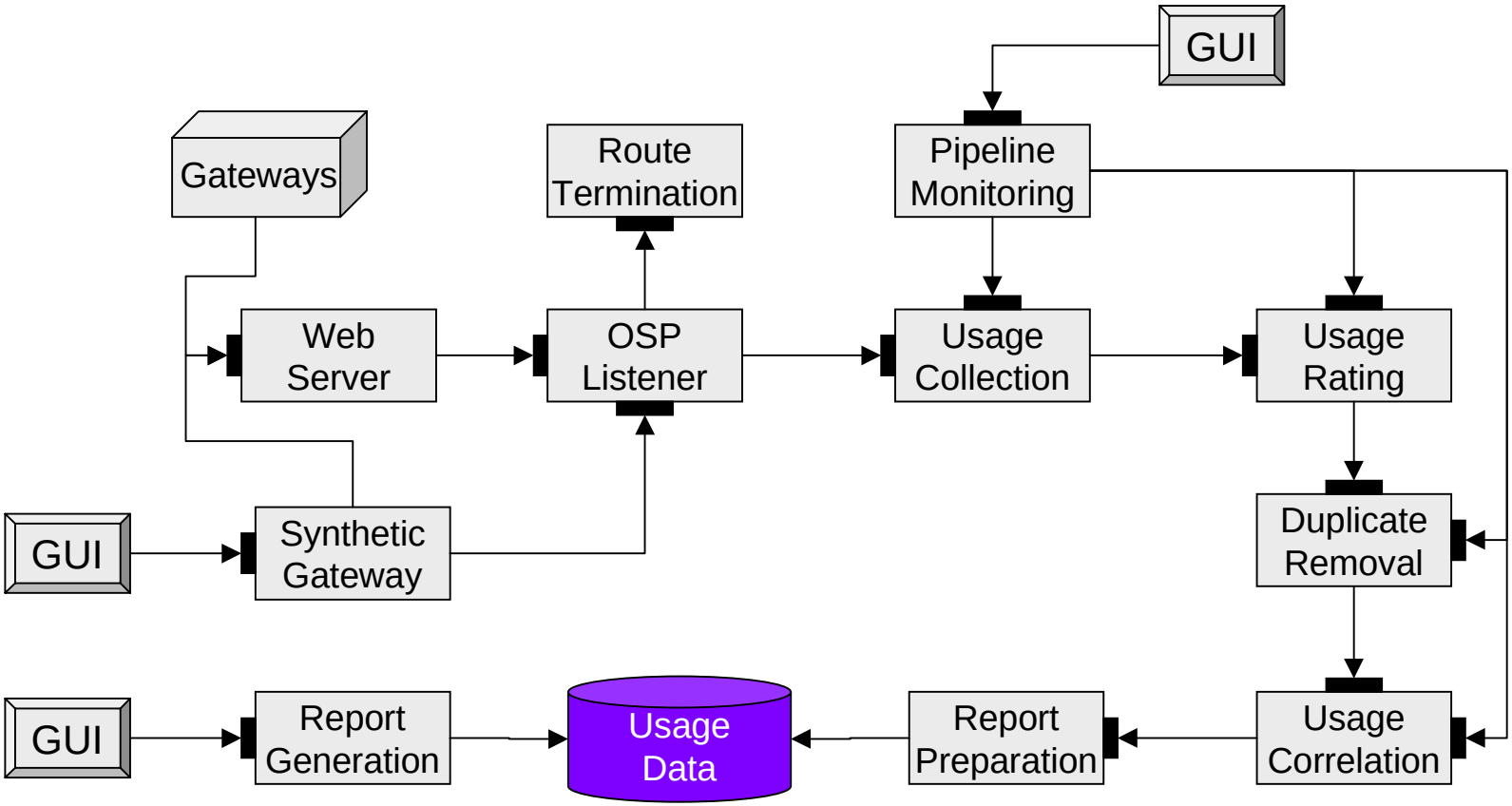


VoIP Processing Phases

- Authentication
- Authorization
- Routing
- Call Completion
- Collection
- Rating
- *Duplicate removal*
- *Correlation*

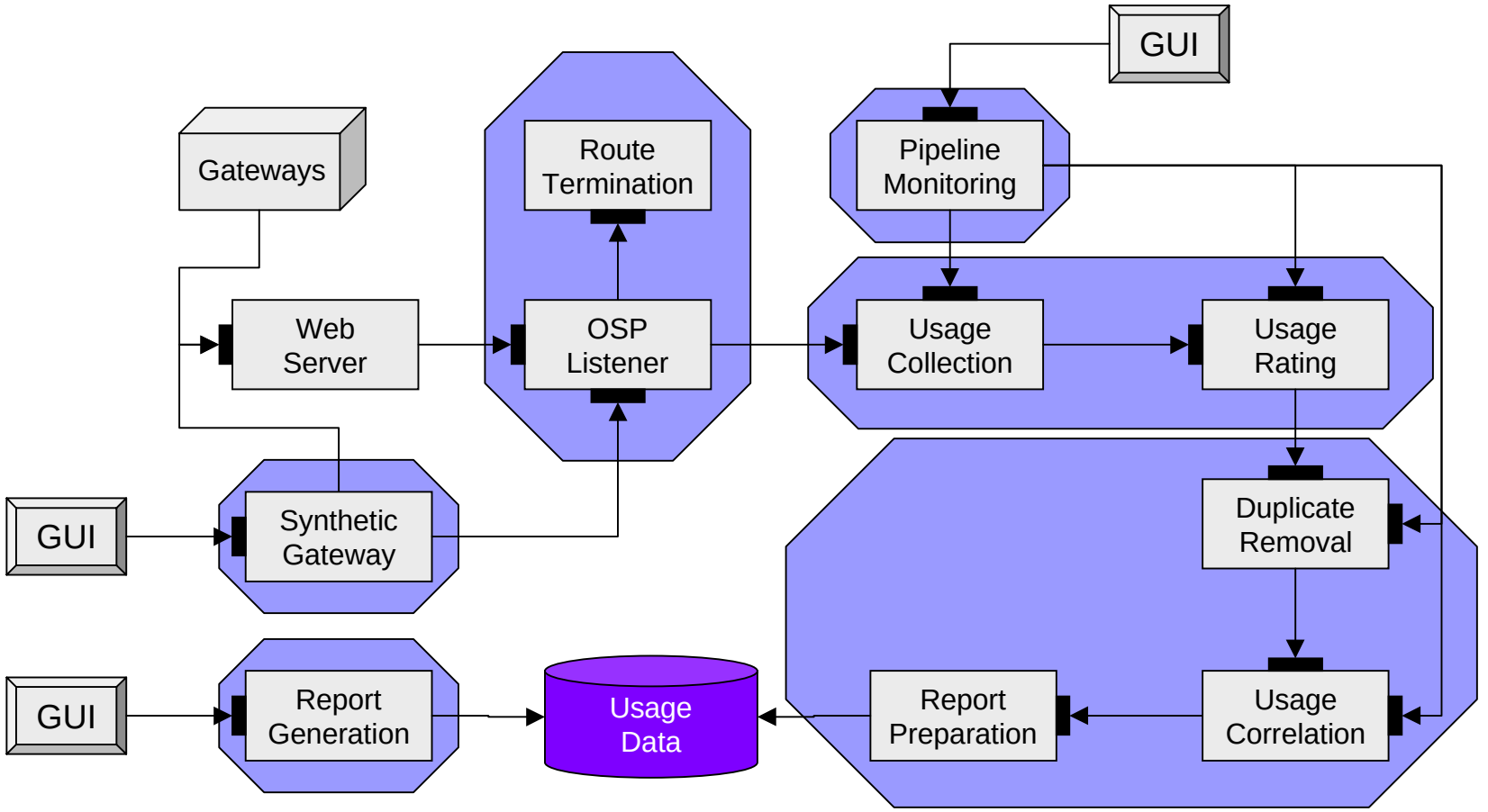


Pipeline Computational Objects



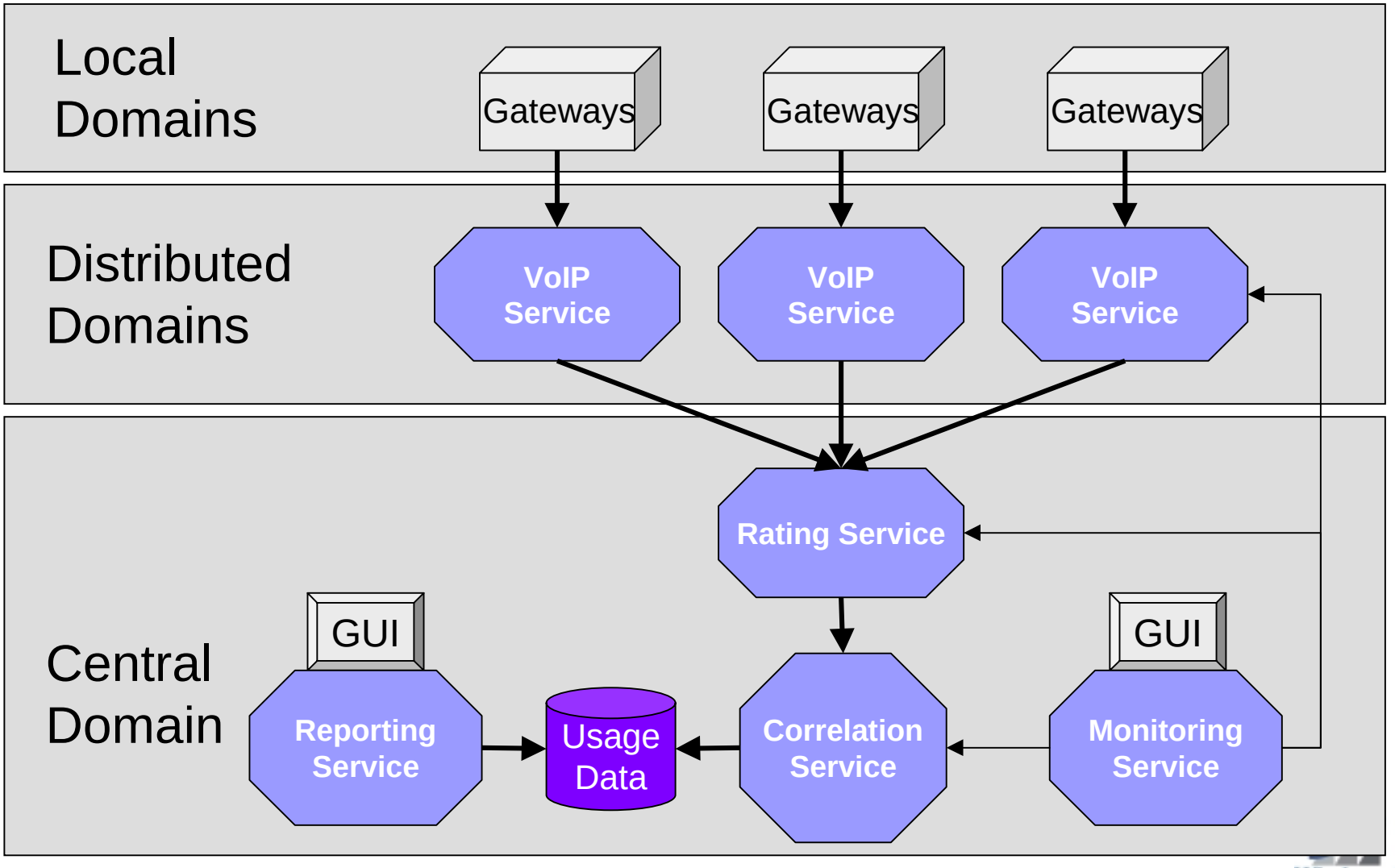
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Pipeline Service Groups



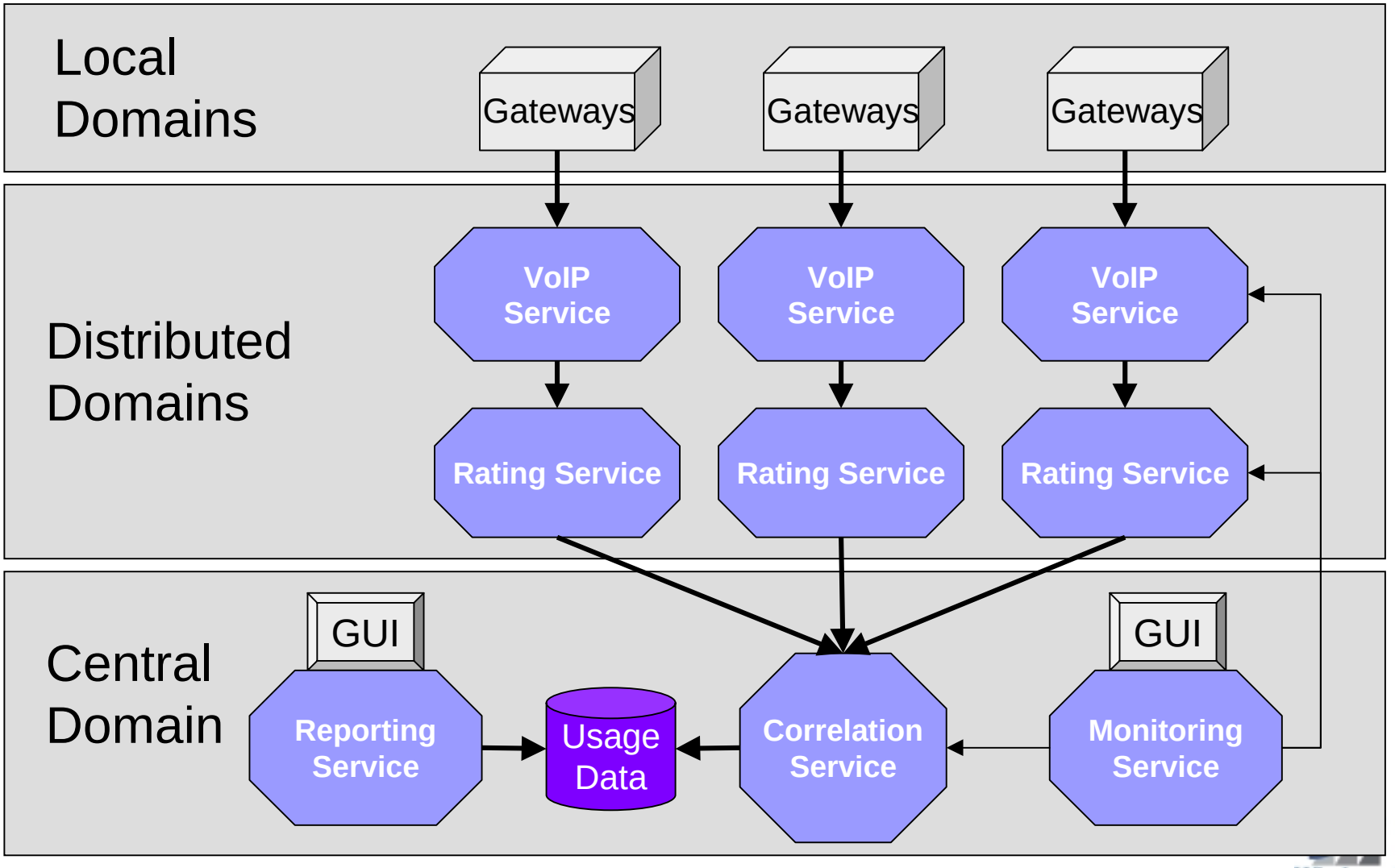
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Multiple Service Instantiations



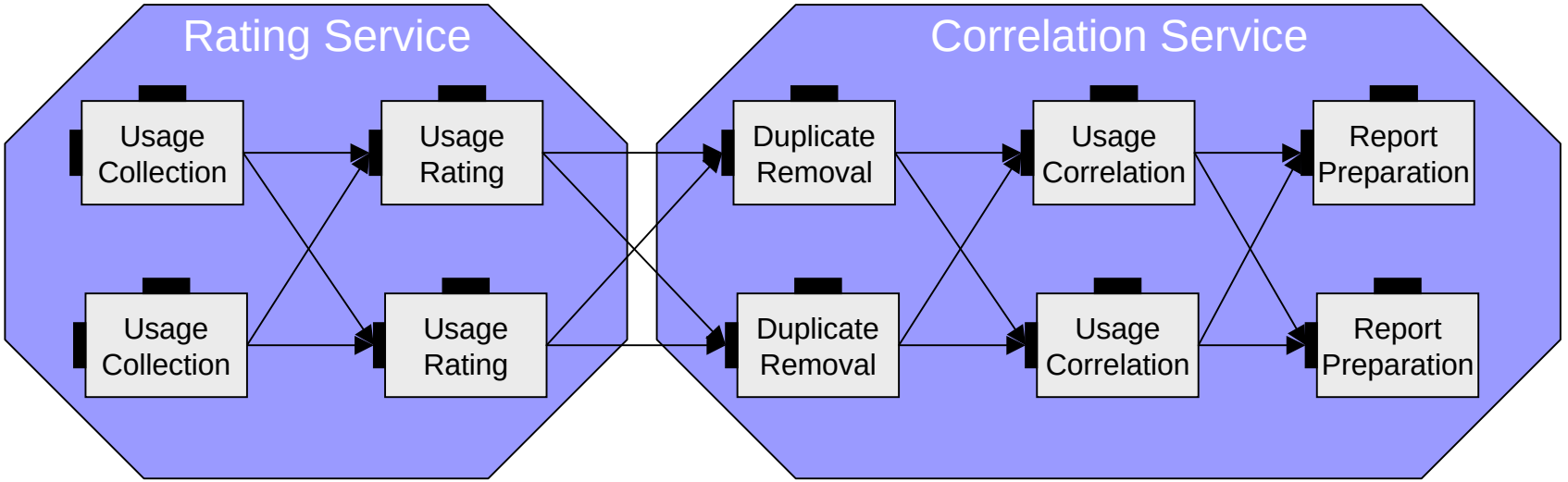
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Service Deployment Flexibility



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Redundant Service Components



- High Availability
- Improved Scalability

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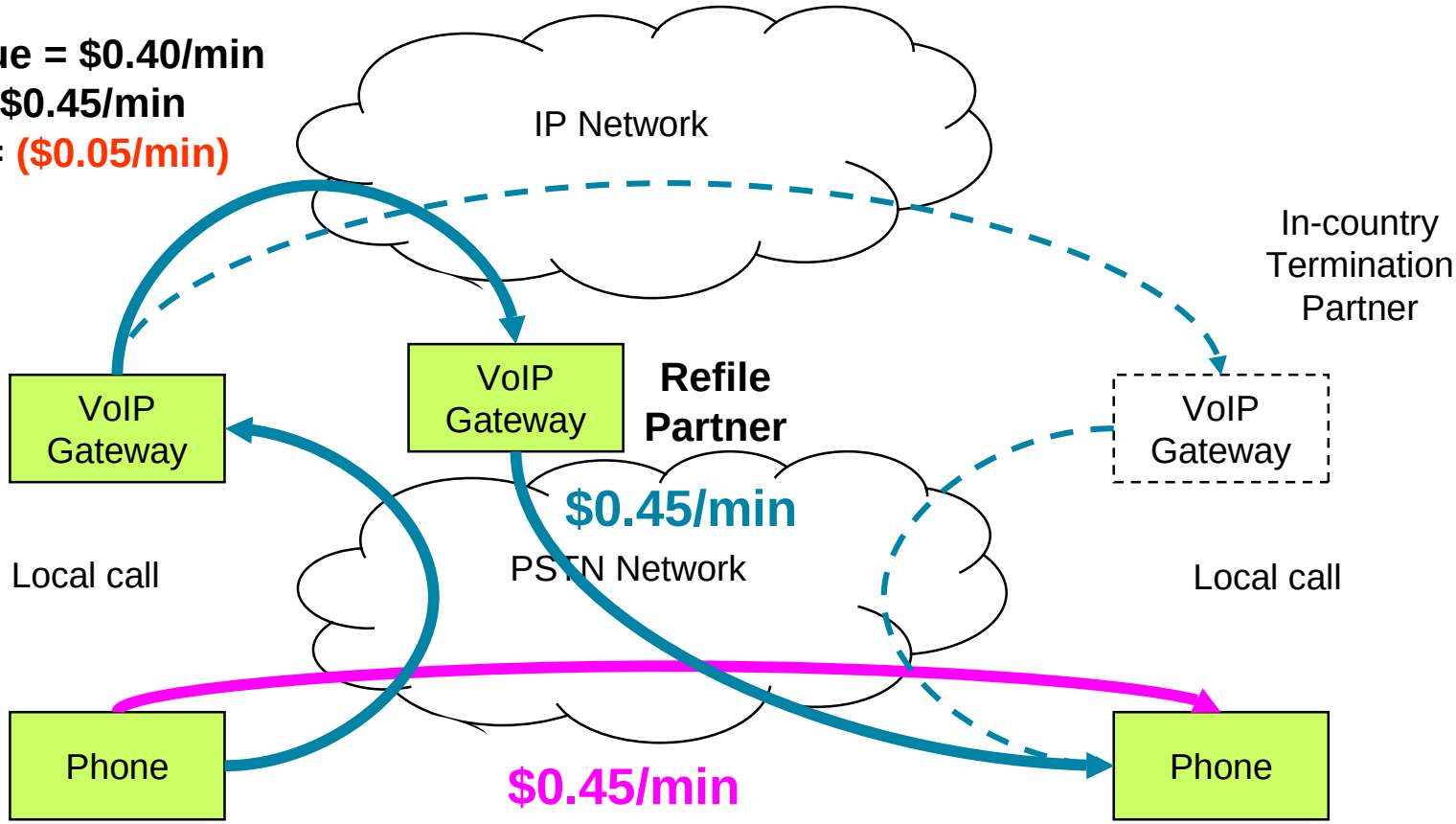
Results

- We built a real-time IP services settlement system
  - First release targeted at VoIP service
  - It took longer than expected
- Distributed component objects worked great
  - TINA DPE stuff was too “not mainstream”
  - CORBA, J2EE, .NET all seem reasonable now
- The hard problems weren’t in distribution
  - Database infrastructure (O/R mapping) & tuning
  - People, training, methodology, turnover, politics
- A “successful” *Death March*?

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Oh Yes, The Refile Partners…

Revenue = $0.40/min
Cost = $0.45/min
Profit = ($0.05/min)



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Epilogue

- The VoIP services market evolved
  - ISPs didn't want to become Telcos
  - Long distance rates dropped
- The Internet bubble burst
  - We all got caught violating Ferenghi *Rules of Acquisition*
  - Investors demanded a path to profitability
  - Focus shifted from top line to bottom line
- "Core vs. Context" thinking prevailed
  - Settlement outsourcing became viable

"Success is going from failure to failure
without a loss of enthusiasm."
- Winston Churchill

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