GOPS

Goal-Oriented Policies for Self-Management
An Overview

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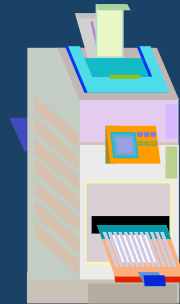Björn Bjurling, May Yee Chong , Tomas Olsson (SICS)
Ramide Dantas, Carlos Kamienski (GPRT)

- Background
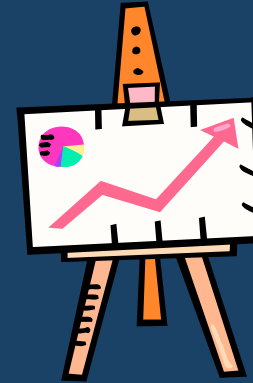- GOPS Approach
- Scenario
- Goal Refinement

- Architecture
  - Autonomic Entities
  - Architecture applied to Scenario
- End of Overview
- Future Work
- Contractual Aspects

Telecom Service Provisioning

Current State

- Requires Expertise
- Gap between Business and Network Policies
- Long Time to Market
- High Management Costs

Future Challenges

- Multi-vendor
- Cross-organizational
- Demand for interoperability
- Service Markets
- Demands on fast cycles

Use of Policies for Service Provisioning

Policy Based Management

- Separation of rules for a system's functionality and implementation
- Simplifying management of likely situations by automation
- Management by triggering actions based on conditions

Policy Refinement

- Enable network administration by specifying only high level policies and goals
- Starts with formal representation of a system
- Off-line, centralized, procedure

Limitations

- Infeasible to maintain complete knowledge of every subservice
  - complexity
  - third party nondisclosure of internal service structure
- Without complete knowledge of a subsystem, governing policies may be hard or impossible to specify

Limitations

- requires complete knowledge of the internal structures of managed subsystems
- requires global knowledge of a system

The GOPS Approach

Goals instead of Policies

- A goal specifies a desired state of a devise or a system
- Refinement process
  - high-level goals to low-level network configurations
- No need for detailed knowledge about subsystems

Autonomic Entity

- Understands and can process goals
- Is able to refine a goal into sub-goals
- Enters agreements with other AEs for the provision of services
- Can compose services

GOPS Contributions

- Algorithm for automated refinement of business goals and composition of services
- Autonomic entities
- Facilitation of cross-organizational services
- Decentralization
- Shorter Time To Market
- Reduced costs

GOL!

Scenario

Virtual Flower Scenario

- Service for sending virtual and real flowers on Mother's Day
- Describes service life-cycle and interactions between service components
- Seemingly simple services are potentially complex

1—Business Concept

- High-level goal:
  Provide service for children to send virtual and real flowers to their mothers on Mother's Day

Scenario

2—First Refinement

- Find out what services are needed for materializing the business idea
  - Ordering
  - MMS
  - SMS
  - Billing
  - Florist
  - Delivery Service

3—Setting up services

- Negotiate with service providers about the delivery of the required services
  - time constraints
  - service levels
  - failure to meet agreement

Scenario

4—Service Deployment

- Marketing
- Payment infrastructure
- Complaints infrastructure

5—Service Operation

- Child has seen the ad and wants to send a virtual flower to its mother
- Choice of flower
- Child pays
- Mother receives virtual and real flowers
- Monitor progress

Goal Refinement

Refinement requires

- breaking down goals to subgoals
- matching subgoals to offered capabilities
- having a strategy when a subgoal cannot be matched

Service Level Agreements

- How to find subservices
- negotiation of service goals
- entry of agreements
- Life cycle of an AE

Self-management

- What if Florist is out of flowers?
- Truck breaks down
- Unexpectedly high demand
- Change of goals

Governance needed

- An AE needs a Governor
  - reacting to monitored data
  - orchestrating services
  - understanding goals
 - refining goals
  - composing services

Autonomic Entity

Hierarchy

- An AE has one or several subordinate AEs and one Governor
- A subordinate AE provides a service
- Communication
  - Refined goals (COs)
  - Offered Services (POs)
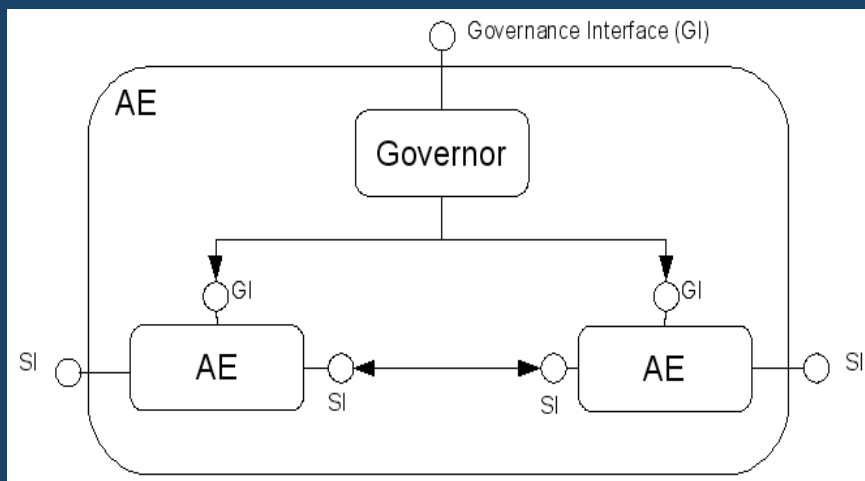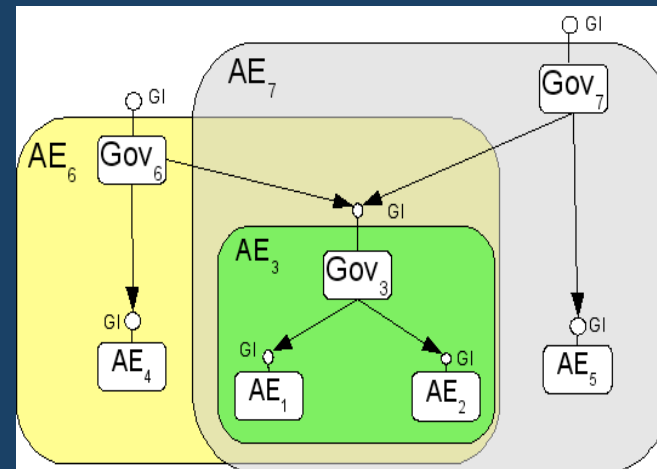 - Performance reports

Autonomic Entity

- Created via goal refinement
- Has one Governor
- Exposes Governance Interface (SLAs)
- Exposes Service interface
- Is a network element
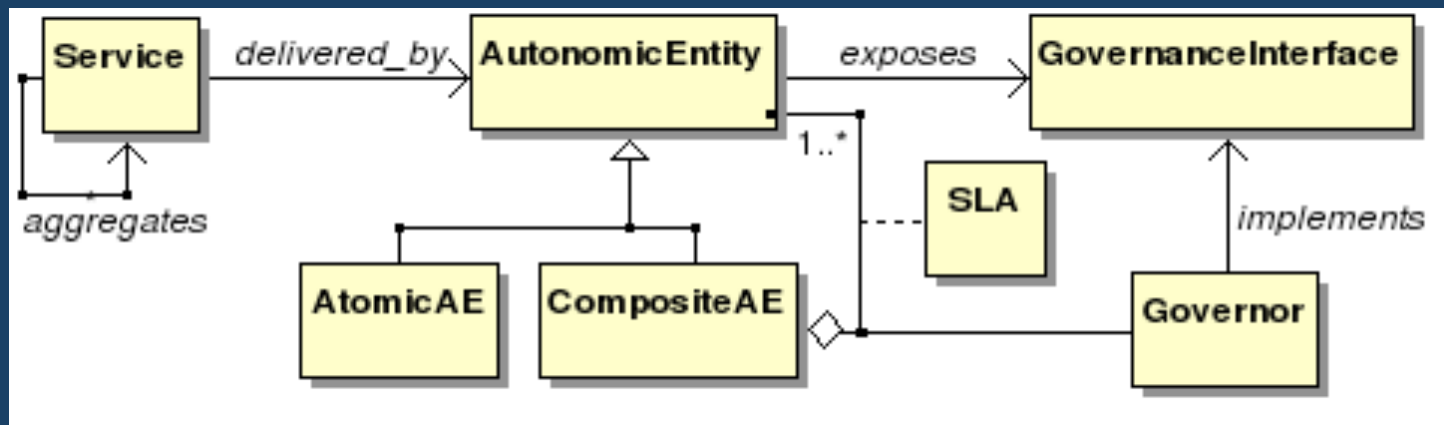
Autonomic Entity

Encapsulation

- Hierarchy of AEs can be interpreted as a single entity

- Service-centric architecture

Governance

- The behaviour of an AE is controlled by the governor

- Governance interface
  - Communication of goals
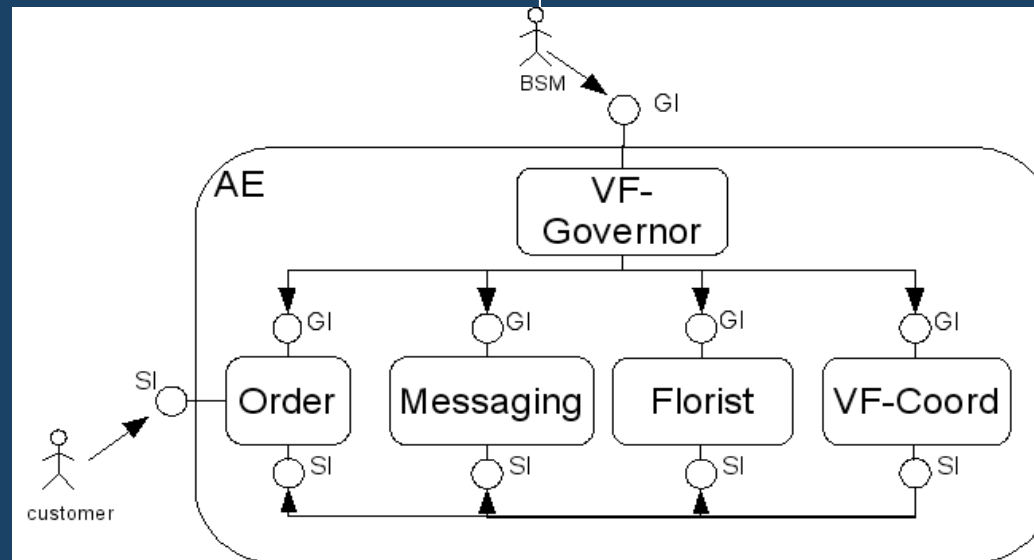 - Communication of performance
  - ...SLAs

Architecture Applied to the Scenario

Virtual Flower Service

- Business Service Manager interacts with VF-governor

- Customer interacts via service interface

Goal Refinement

- High level goal is broken down by the VF-governor

- Refined goals are passed to subordinate AEs

- Failure of internal AEs are reported to the VF-governor

End of Overview

Serious Problem

- Current Network management paradigms will not cope with future complexity and demand for interoperability

GOPS Framework

- Governor controlled autonomic entities
- Automatic goal refinement
- Automation of setup and deployment of new services

We have discussed

- The virtual flower scenario
- Goal refinement
- Architecture
  - Autonomic Entities
  - Governor
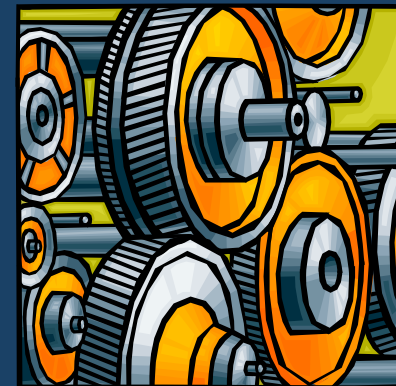
Future Work

Goal Refinement

- Languages for describing SLAs, AE capabilities, and goals
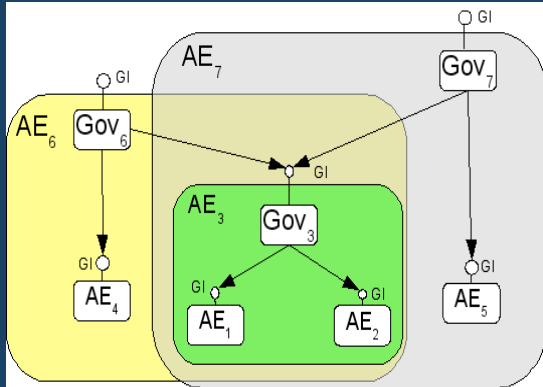- Methodology for goal refinement

Architecture

- Prototype implementation of the governor and the Autonomic Entities

Contractual Aspects in GOPS

Communication in AEs

- Two or more parties
  - Governor wants a goal achieved
  - Subordinates fulfil goals
  - Subordinates have known capabilities
- Governor is given a goal
  - knowledge about subordinates capabilities
  - uses goal refinement for orchestration of subordinates services
- Governor enters agreements with subordinates
  - SLAs
  - Consumer Level Objectives
  - Provider Level Objectives

- Consumer Level Objective
  - Goal
    - Several subgoals
    - over time (program)
    - conditions
  - Required input
    - for goal refinement
  - Required feedback
    - for self management

- Provider Level Objective
  - Capabilities (services)
    - expressed as goals
  - Required input
    - service specific
  - Obligations

Building an AE

Discovery

- Governor keeps track of existing PO:s, (LOI)
- POs are being composed and announced

Negotiation

- Goal arrives
- Refinement into subgoals
- POs and COs are matched
- considerations, preference
- SLAs formed

Operation

- Performance monitored
- SLAs monitored
- Self-management
  - changed goals
  - changes to operational env
- Keep contact with other elements

Hidden Business Process

Local Knowledge

- A subordinate in an AE has its PO: (C, R, O)
- The obligation is a hint to the governor on how to orchestrate the composite service

Building a BP

- While refining, matching, and composing, a BP is created from the POs of the subordinates

Contractual Aspect

- Subordinate promises a service
- on the condition that an fulfilment of an obligation is arranged by the Governor (Holder)
- Considerations
  - Gov pays
  - Subord gives up its right to freely choose where to perform its services
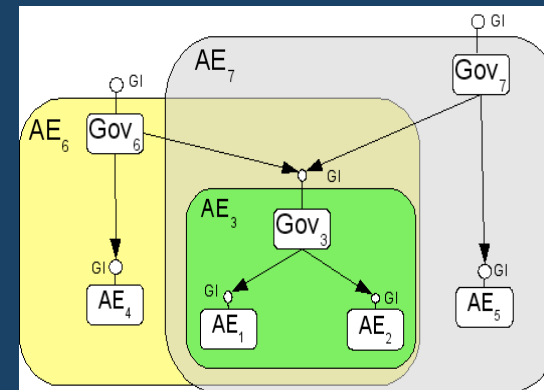
Conclusion

Overview of GOPS

- Serious problem for the telecom industry
- GOPS aims at self-managing network elements
- Automated service creation and goal refinement

Some Contractual Aspects

- Language
- Communication
- Fabric of AEs
- Orchestration
- The AE Cycle