

ETSI Workshop on Future Network Technologies Standardization



Standardizing a Semantic Context-Aware Network Architecture

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Outline

- Future Internet requirements and design approach
- A semantic context-aware network architecture (I2Cat - Tarifa)
- Standardization of Role-based architectures
- Conclusion

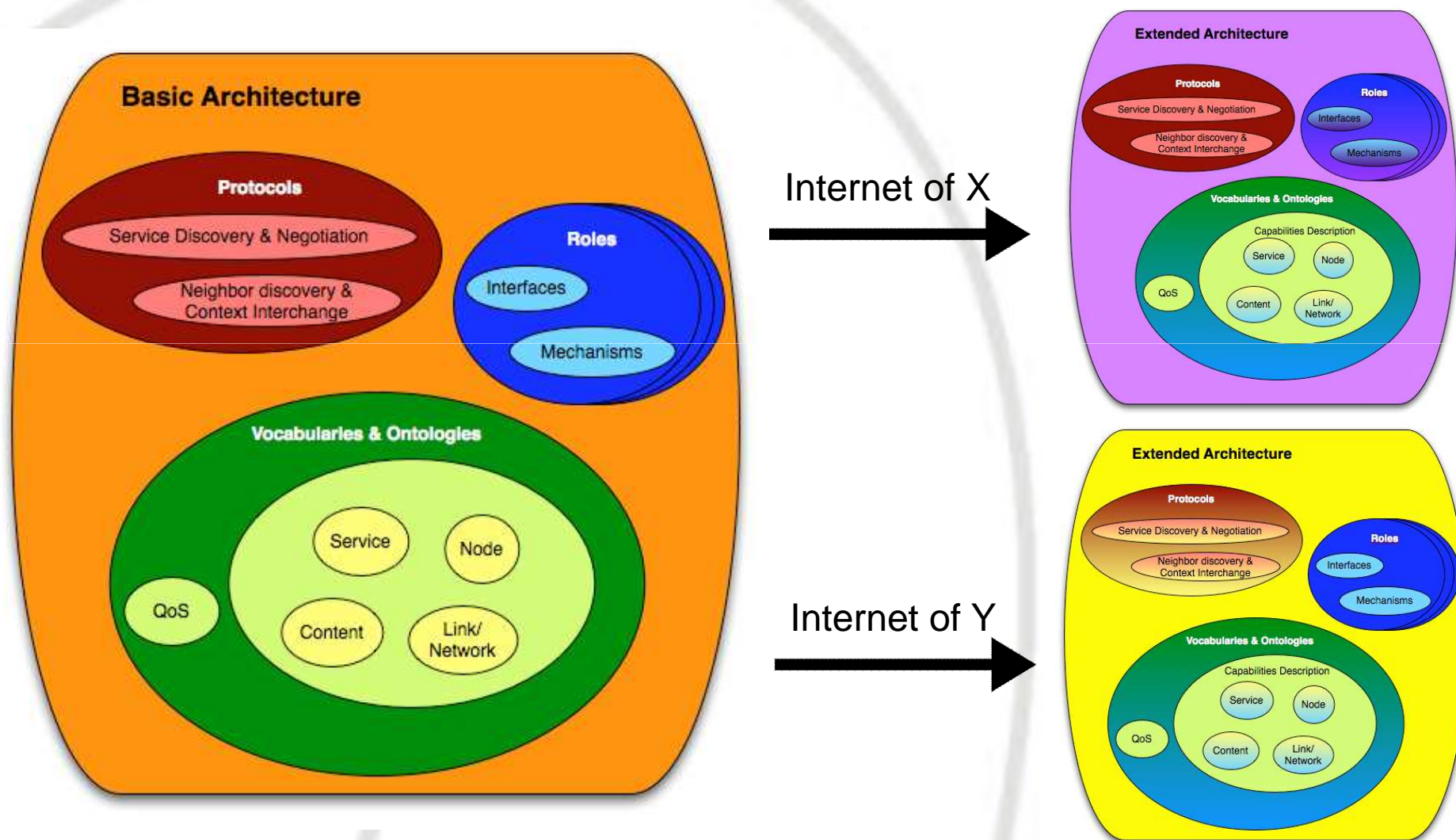
Future Internet Requirements

- Ubiquity
 - Device-Independence
 - Anyhow
 - Mobility
 - Wireless support
- Simplicity to the user
 - Context-awareness
 - Anytime, anywhere → In-Network intelligence
 - Flexibility & adaptability (run-time)
 - Self-X (configuration, healing, optimization,..)
- QoS provisioning & assuring
 - Enhancing QoE
 - SLA agreements & contracts
- Seamless discovery of services and content
- Enhanced user control
- Effective Delivery
 - Multicast, Anycast, Unicast

Future Internet Design

- Accommodate restricted devices & networks along with high capacity media networks
- Change of approach
 - Design a minimum architectural principles and mechanisms
 - Valid for all types of devices (including restricted ones)
 - Extension of the architecture for any other environment
 - ★ Device
 - ★ Network

Future Internet Design



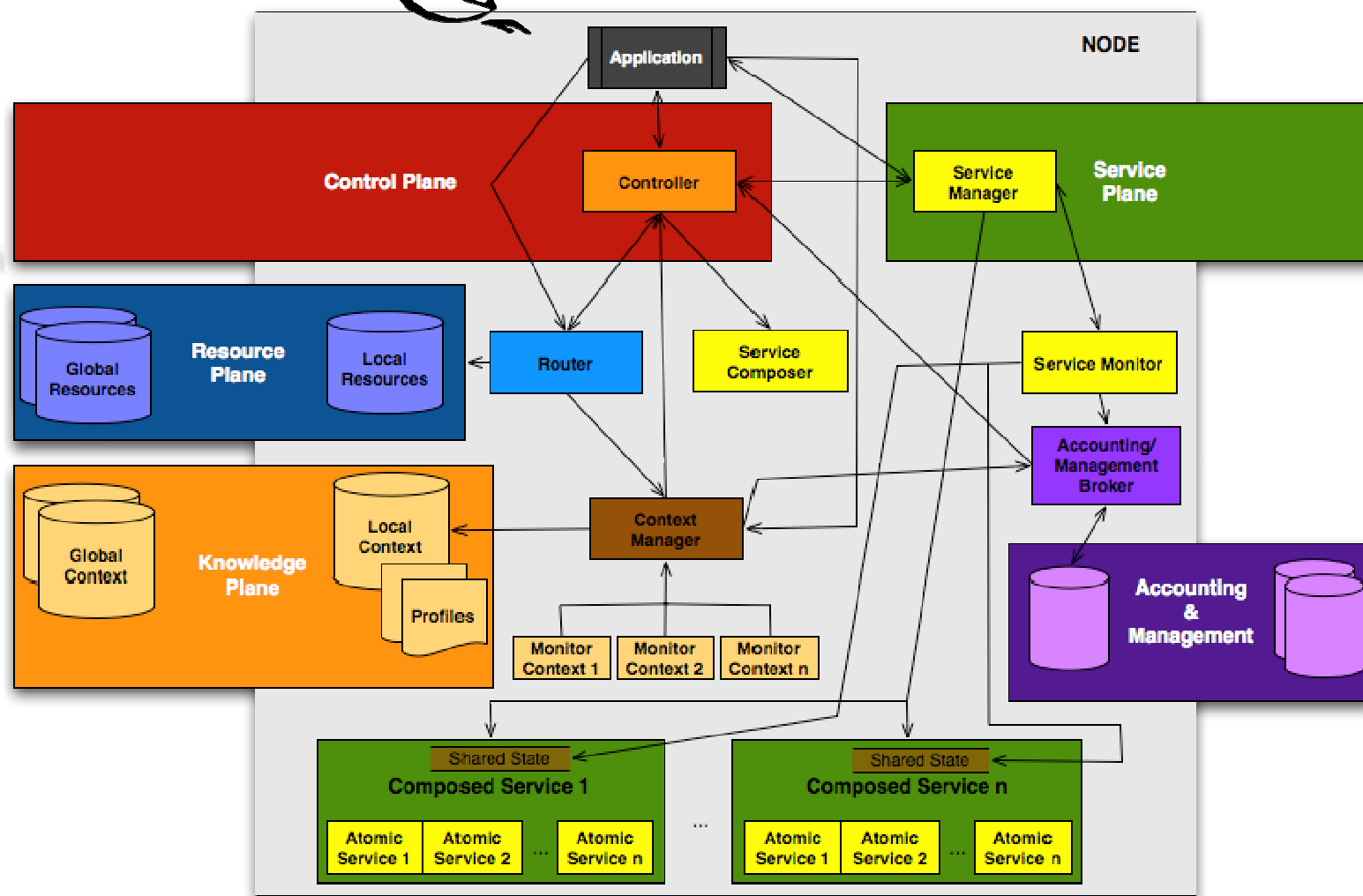
TARIFA Solution

A stylized, black, abstract graphic of a person or figure, possibly representing a network node or a user, positioned behind the main title.

- Clean-slate/Disruptive network architecture
 - Flexibility: Role-Based Architecture
 - Context-awareness: In-Network and edge intelligence
 - Context exchange
 - Awareness to context conditions in routing/service discovery and service/route selection and negotiation
 - Efficient Delivery (Anycast, Multicast, Unicast)
 - Semantic Routing (Semantic Cast)
 - QoS provisioning & assuring: Virtual Circuit
 - Self-X
 - Configuration, healing, optimization,...

More info: <http://www.i2cat.net/en/projecte/tarifa-1>

TARIFA Solution



Standardizing a Role-based Architecture



- Future Internet initiatives based on RBA with focus semantics and context-awareness require standardizing several key elements
- Objectives:
 - Loose coupling
 - Required to achieve high degree of interoperability
 - Whilst still supporting and encouraging service, device and network diversity.
 - Flexible Evolution
 - Avoid architecture ossification, enforce evolution
 - Allow architecture adaptation to new environments and purposes
 - Flexible and seamless introduction of new features

Standardizing a Role-Based Architecture

- Means:
 - Standardizing basic network architecture capabilities
 - Roles interfaces
 - Basic control protocols
 - Basic ontologies and related vocabularies
 - Provide mechanisms to introduce new roles, protocols and vocabularies and extend old ones with ease.
 - Give room for developing new services on top of the architectural framework
 - Provide means for service orchestration
 - ★ Both at network and application level
 - Allow building custom and flexible workflows for different connections and/or services

Standardization considerations

- Roles
 - Abstract Interface definition
 - Syntax and semantics
 - ★ Generic enough
 - ◆ Implementing mechanisms should easily adopt them without burdening its operation
 - ★ But clearly define and delimitate service access and realm of operation
 - ◆ Separation of different services' concerns, interests, domains of application and scope
 - Identifiers of roles and derived implemented mechanisms

Standardization considerations

- Fundamental protocols
 - Basic control protocol
 - Neighbor discovery
 - Context interchange
 - Service discovery and negotiation protocol
 - Declarative syntax for semantic routing
 - ★ Basic semantic routing algorithm
 - Service negotiation procedure
 - Role allocation/configuration syntax
 - Service orchestration mechanism

Standardization considerations

- Vocabularies
 - Underlying ontology definition
 - Crystal-clear definition of vocabulary syntax (form) and semantics (meaning)
 - including possible attribute values
 - Extensions to known vocabularies
 - Introduction of new vocabularies
- Different realms of application
 - Resource capabilities
 - Device, service, content, user, link/network
 - QoS

Conclusion

- Key elements to be standardized: Roles, Protocols and Ontologies/Vocabularies
- Future networks must accommodate heterogeneity and diversity in all of its aspects
 - Seamless interoperability and ubiquity
- Evolution Vs Interoperability
 - New network architectures should be allowed to evolve without reformulating the whole standard
- Standards should be formulated with loose-coupling principles
 - Avoid strict coupling of legacy networks standards