Management of Large Networks

New Frontiers in Computing
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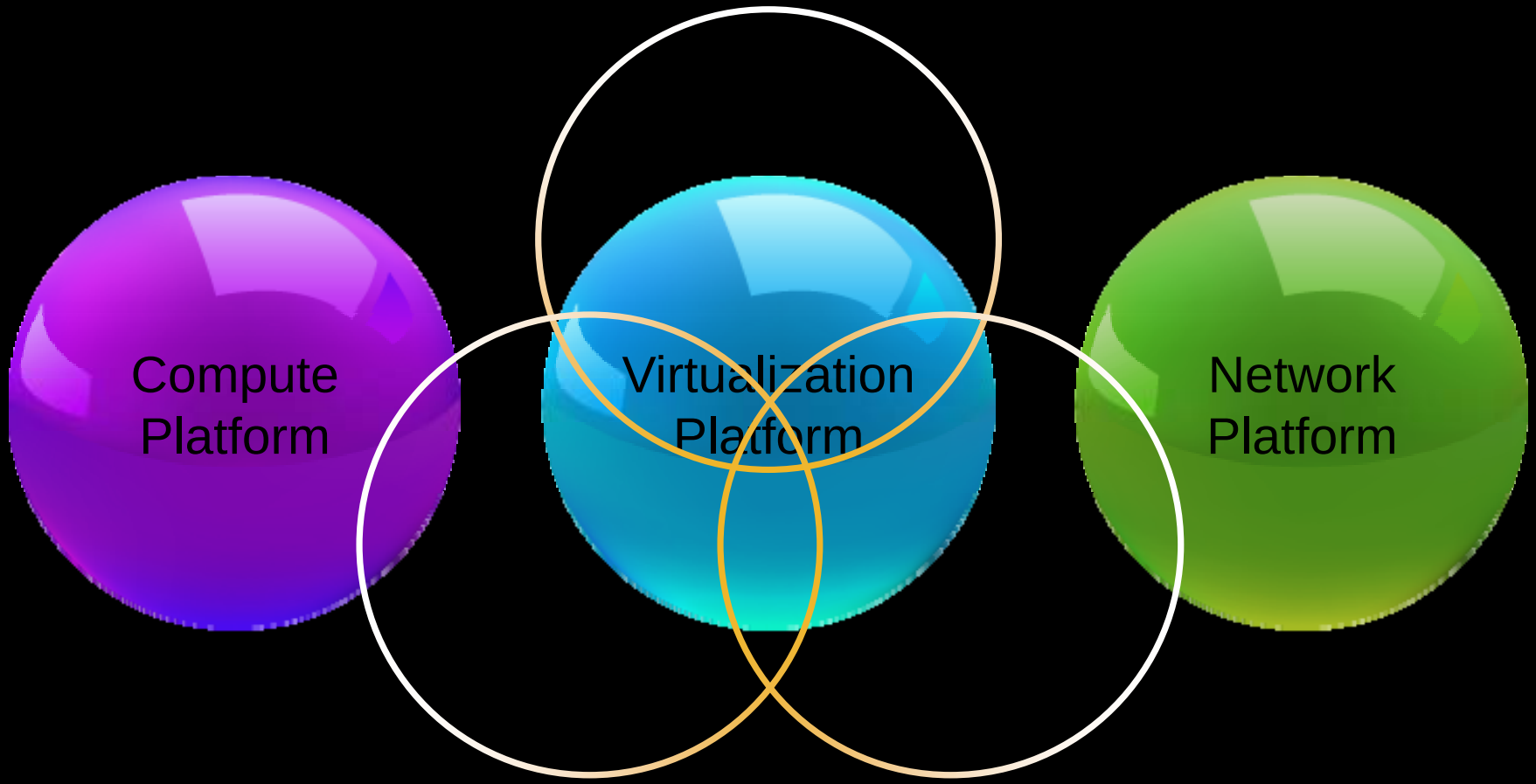
Agenda

- Reasons for Network Growth
- Concepts
- New Paradigm
- Q & A

Reasons for Network Growth

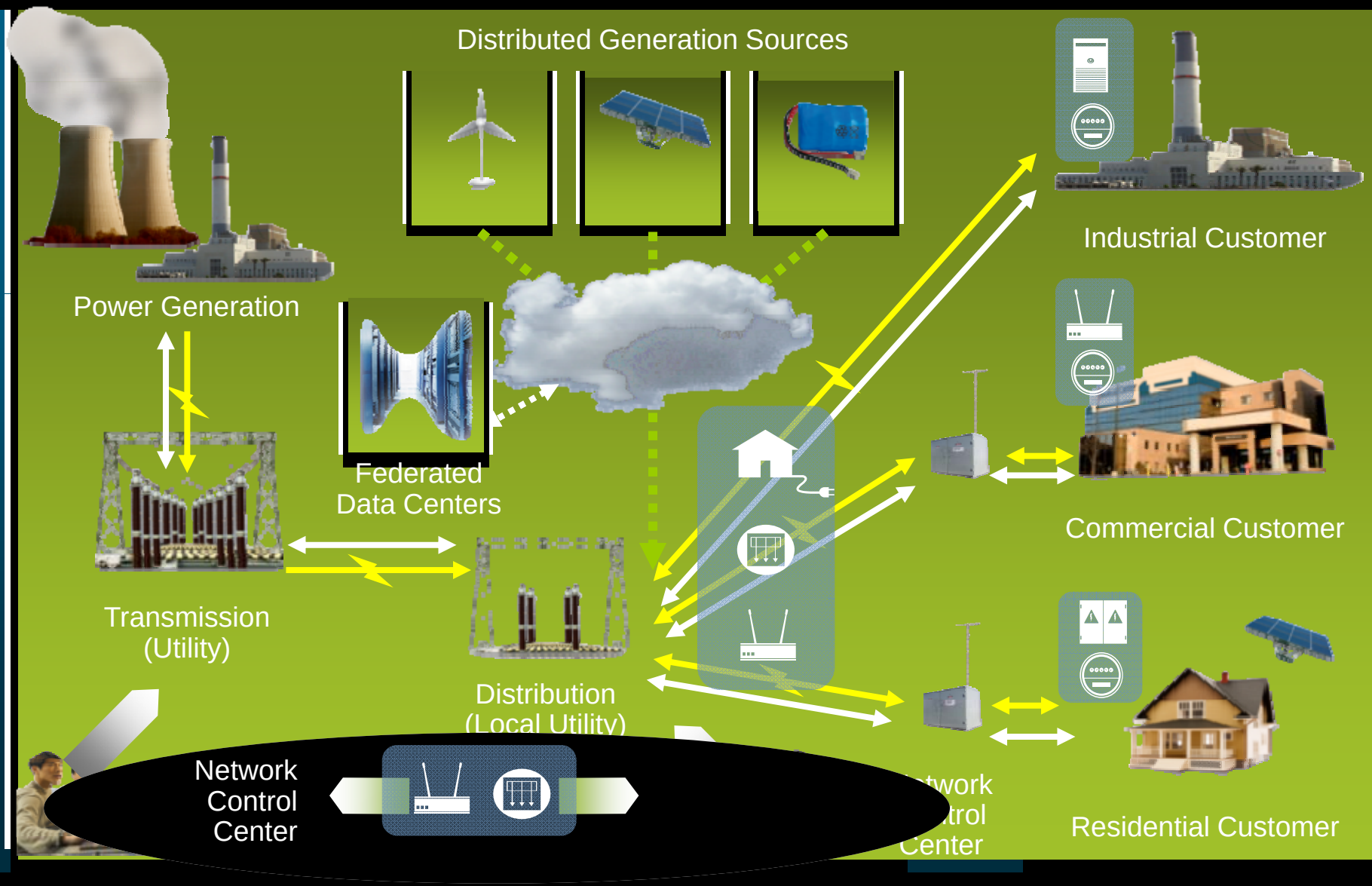
Unified Computing



Integrated architecture simplifies set-up, improves business metrics, and enables dynamic provisioning

Power Management

Smart Grid



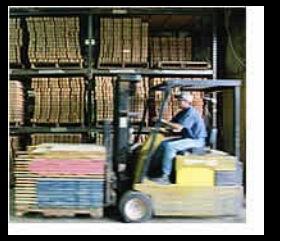
Smart Objects
An endless number of applications

Healthcare

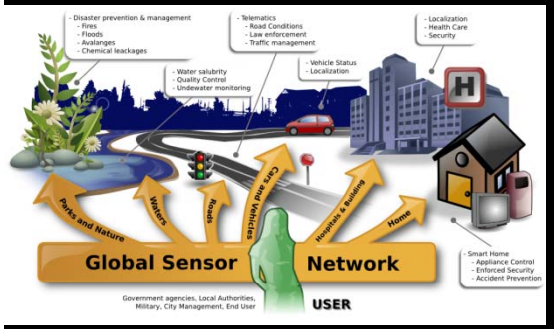
Defense

Predictive maintenance

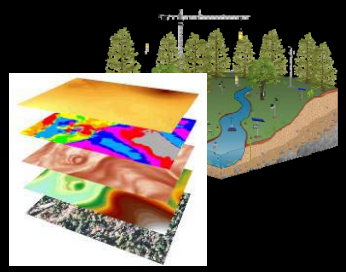
Energy Saving (I2E)



Improve Productivity



Smart Cities



New Knowledge

Intelligent Building

Agricultural

High-Confidence Transport and assets tracking

Industrial Automation

Smart Grid

Smart Home

Other Observations….

- Network Management tasks more complex
- Business critical application increasing depend on net
- High dependency → Higher availability requirements
- Short reaction times
- Continuous cost pressure

Concepts

Important Concepts

- Hierarchical Data
- Bulkable
- Idempotent
- Lenient
- Data-Driven
- Transactional
- Asynchronous Execution
- Efficiency

-- Efficiency --

Should not waste space

Should not require a supercomputer to process

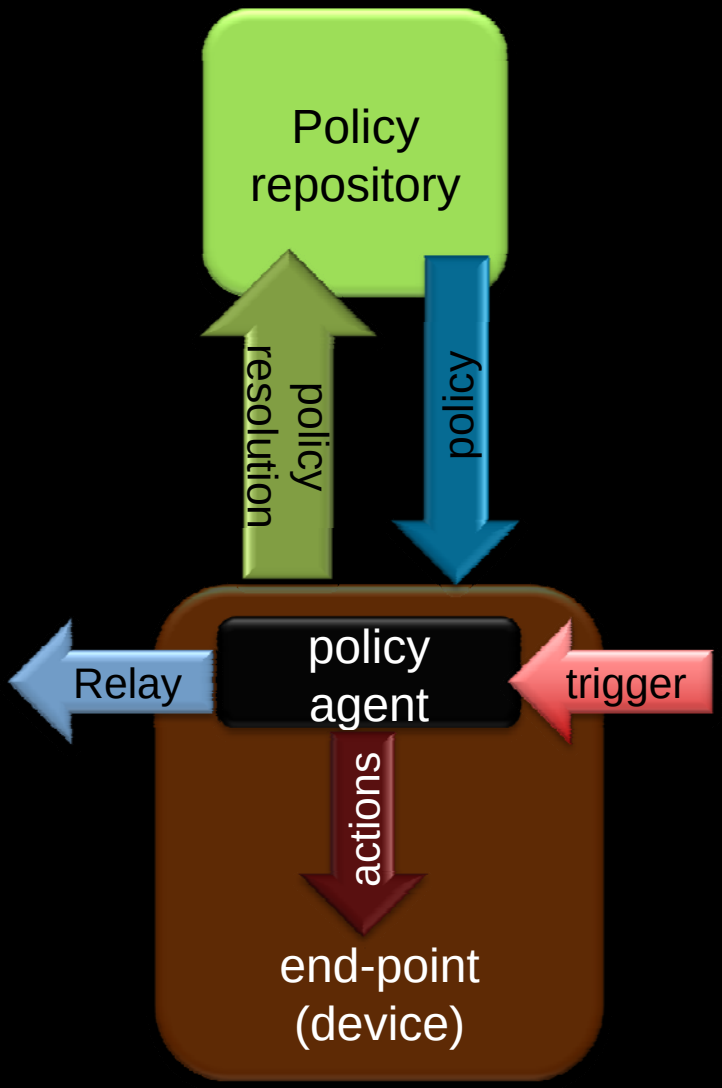
Should not be verbose

Should not require multiple interactions to achieve simple things

Lean is always good in computing

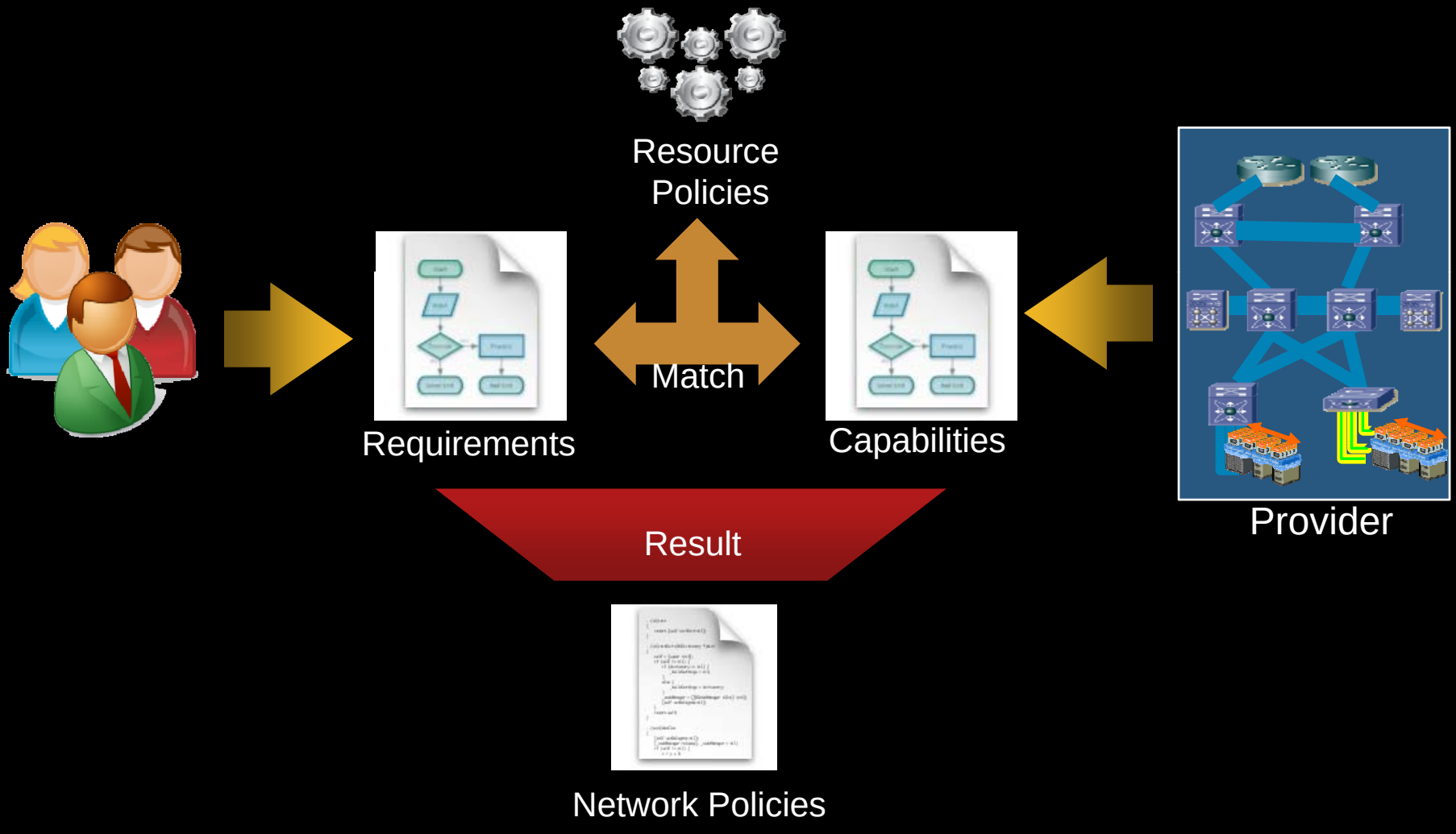
New Paradigm

Basic Principles

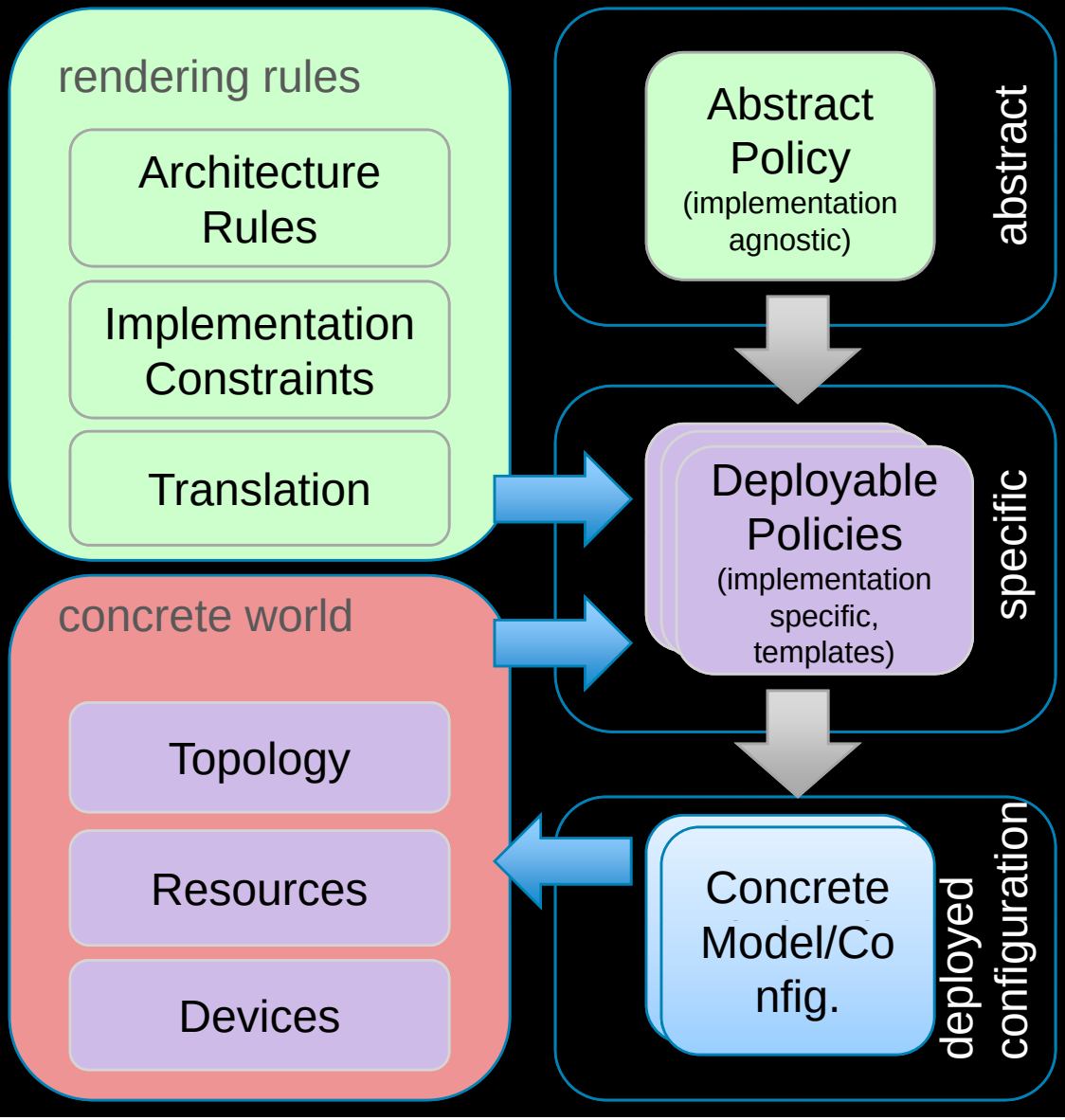


- No top-down management
  - Triggers
  - Policy Resolution
- Management == extension of control plane
- Management by end-point-resolved policies and rules
  - Treat generalized requirements as triggers
  - Configuration necessary to fulfill a requirement is resolved as policy
  - Policies are self resolved and fully rendered locally
  - Requirements on other end-points are relayed as requirement triggers
- Conceptually recursive

Conceptual Policy Model



Policy Abstraction



Definition Layer
Policy definition is performed via architecture and implementation independent abstract sets of policies. There are no dependencies on connectivity, vendors, models etc.

Rendering Layer
Abstract policies are translated or "rendered" into Deployable Policies. Deployable policies are automatically generated from Abstract Policies with implementation specific knowledge (s.a. devices, resources, topology.) and engineering "rendering" rules.

Activation Layer
Deployable Policies are resolved and applied to specific resources resulting in very device and instance specific configuration.

In the end …

Summary …

- *Network are becoming mission critical and integral part of business and day-to-day life*
- *Networks are becoming large with new physical and virtual devices*
- *Changes require short reaction times*

- Network Management need to become more distributed with common policy and triggers
- Devices interpret and enforce policy and rules

Q & A