# Macrocosm and Microcosm of Internetwork Evolution

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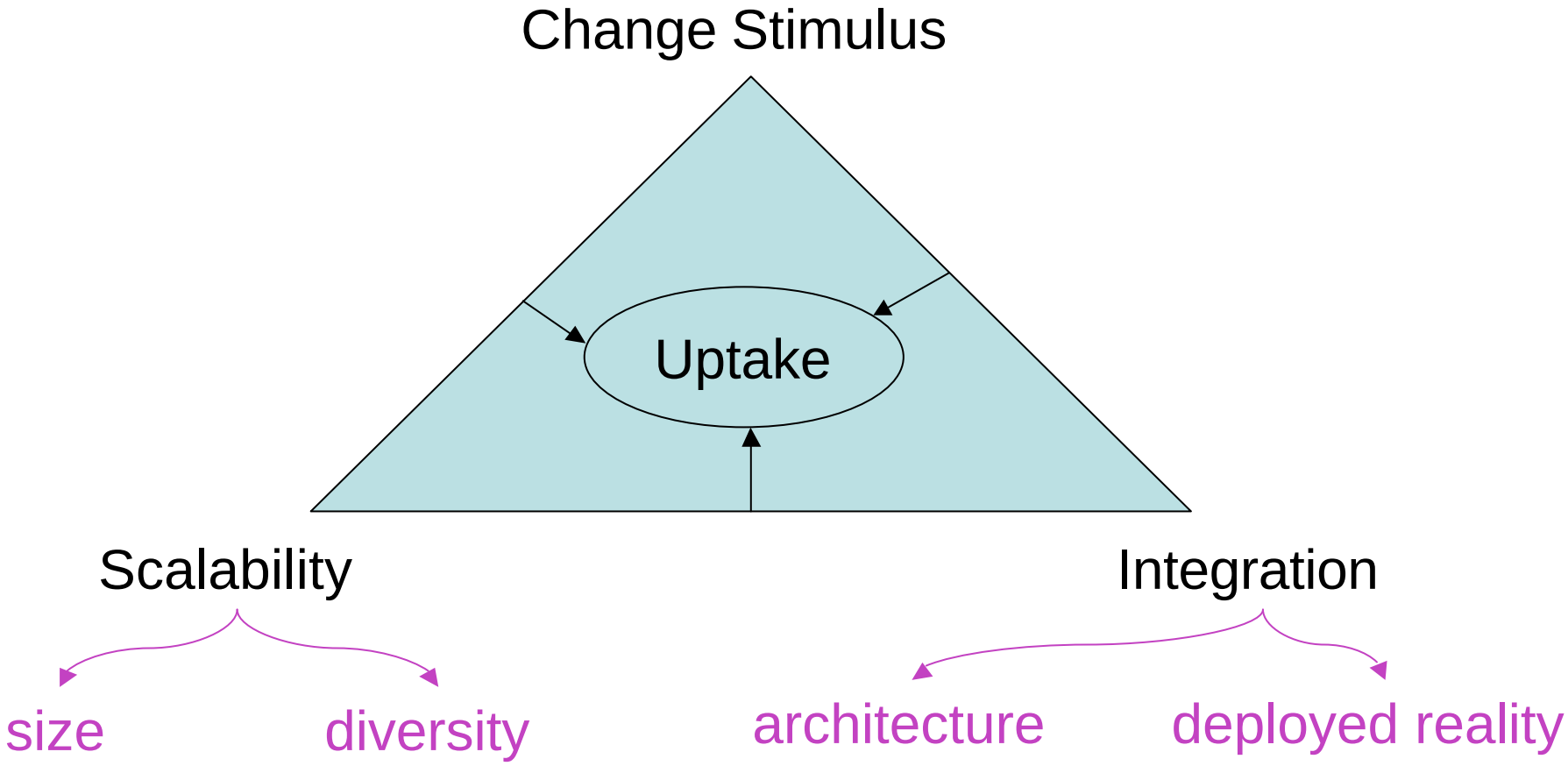
# Overview

- An IETF perspective on engineering evolution
- Cases in point
- Take aways

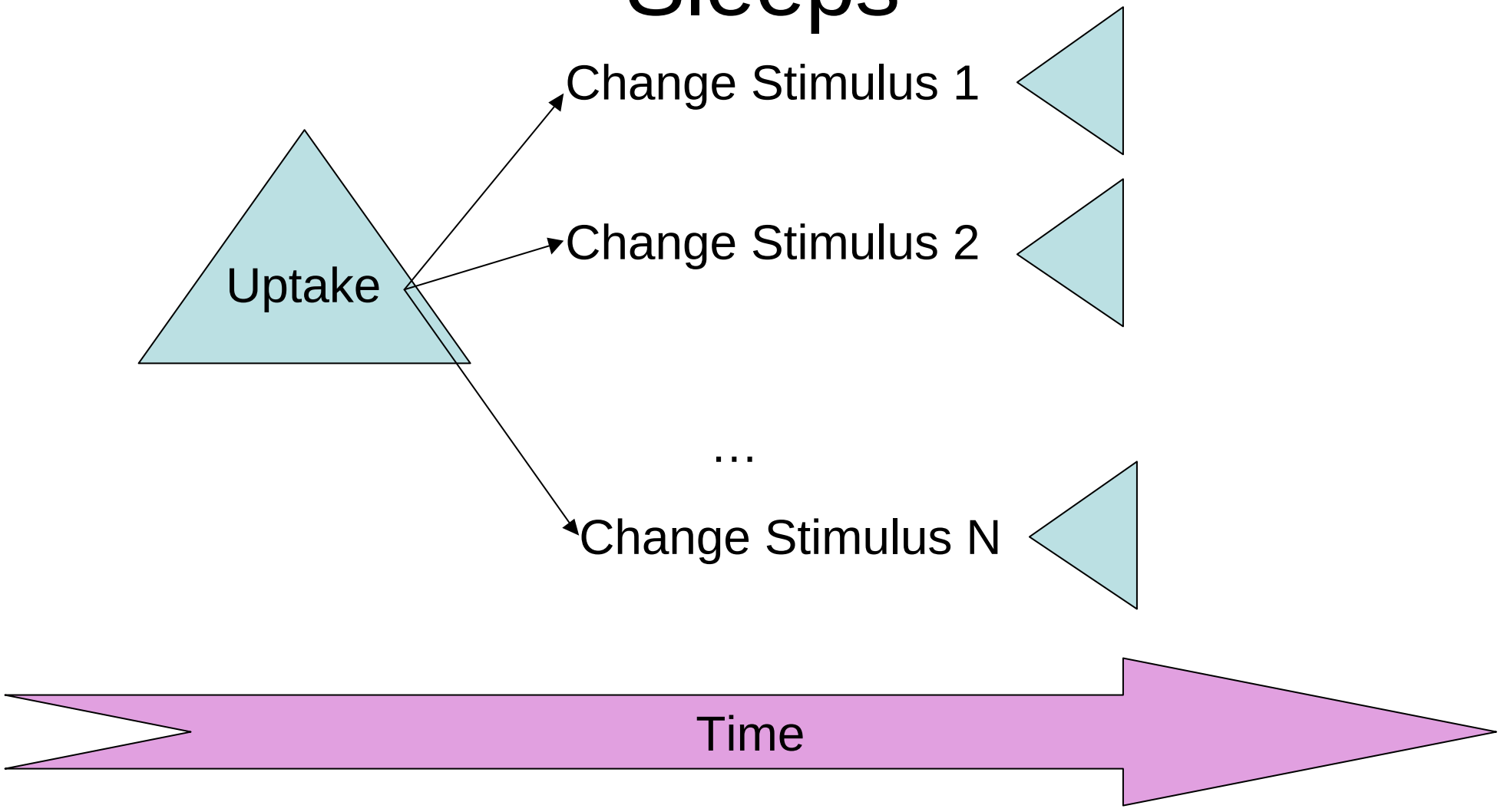
# Microcosm: A Step in Managed Evolution



# Microcosm

- Highly focused, local
  - requirements
  - changes
  - effects
- Locality defined by
  - Geography
    - language
    - local policies
  - Network topology
    - edge
    - core
  - Etc

# Macrocosm: Evolution Never Sleeps



# Macrocosm

- Larger picture is defined by
  - space
  - time
- Requirements overlap and coalesce
- One microcosm’s solution cannot be allowed to upset the applecart for some other microcosm

# Case in point: IP

- Change stimulus
  - notable: running out of v4 addresses
- Integration
  - ongoing transition plans for usage; continuing discussions with RIRs re. appropriate allocation strategies
    - HD ratios
    - minimum prefixes for aggregation
  - review of impacts of change in addressing architecture on other layers (e.g., applications)
- Scalability
  - addressing shortcoming of IPv4

# Case in point: Uniform Resource Names

- Change stimulus
  - need names, not just locations, for applications infrastructure
- Integration
  - naming as scheme within URI syntax
  - discovery of resolution services
- Scalability
  - Dynamic Delegation Discovery Service
  - Current implementation choice:  DNS infrastructure used for discovery of resolution services

# Case in point: URN uptake & follow on

- DDDS generalized, and applied elsewhere
  - ENUM
  - IRIS DREG (domain name whois replacement)
  - Project Liberty metadata discovery service
- Names
  - resource names for IANA registrations built on URNs
  - XML resource names

# Case in point:  DNSSEC

- Change stimulus
  - validatable responses
- Integration
  - revised from original proposal
  - revised NSEC and leveraging proposed whois replacement
- Scalability
  - ccTLD & gTLD requirements varied

# Whitepages and the Global Directory

- No such thing as a global whitepages directory; no solution that
  - was scalable, addressing local & global requirements
  - could be integrated
- whois
  - until last year, defined in RFC954
  - specifically for declaring nodes in the arpanet

# Case in point: IRIS

- Change stimulus
  - need access control, internationalization and better management for whois
- Integration
  - reuse of available components (XML, application transports)
  - framework for expressing queries/responses defining a *service*
    - as opposed to specific schema or attribute semantics, with open-ended query language
- Scalability
  - local access and language rules apply
  - basis for other registries' information services

# Case in point:  IDNs

- Change stimulus
  - Internet comes to Rest of the World
- Integration
  - 8-bit domain/host names wouldn’t fly in some protocols
  - need ascii for consumption as “protocol actionable elements”
  - translation between user presentation (IDN) and domain name
- Scalability
  - still working on variants tables and implications of multiple character sets
- Potential next steps
  - complete the separation of protocol elements and presentation labels

# To Take Away

- What we have learned about evolving from our protocols
  - All universes expand
    - the Internet is a long way from host requirements (RFC1123), when the world was more uniform
    - the Internet architecture adapts
  - Interconnections between network infrastructure components
    - are to be valued
    - require careful evolution (micro/macrocosm)
  - Evolution *cannot* work only on microcosm in isolation
- To the NGN
  - Clearly, NGN's requirements universe will expand similarly
  - NGN as a "macrocosm" needs to be advanced with equal care with respect to "macrocosms"
  - Seeking further input on more change stimuli from NGN