

Learning-Capable Communication Networks (LCCN)

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**IETF 80 Meeting
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(Self-adaptive) Learning-based Control

Current situation: once configured, network systems follow explicitly pre-defined behavior, persistently decide and uniformly execute

=> Self-adaptive learning-based control

- Aware of its own state, activity/behavior, and environment over time
- Capable to react and adapt to changing environment and running conditions over time
- Operate autonomously and when needed cooperatively (no global coordination or synchronization)



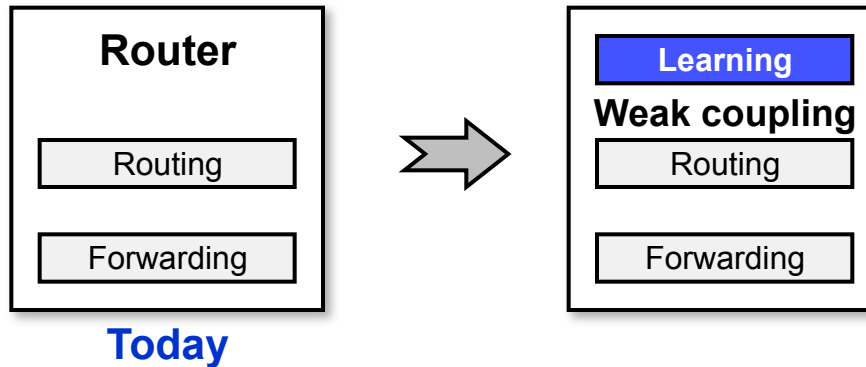
Learning to avoid need to iteratively re-design systems as they should adapt to their environment and running conditions

Role/challenges of learning

- **Diagnose** internal state, own activity, and network environment over time (detect -> identify -> analyze)
- **Adapt** decisions automatically and **Tune** actions automatically, timely, and cost-effectively
- **Determine** when to operate autonomously and when to cooperate

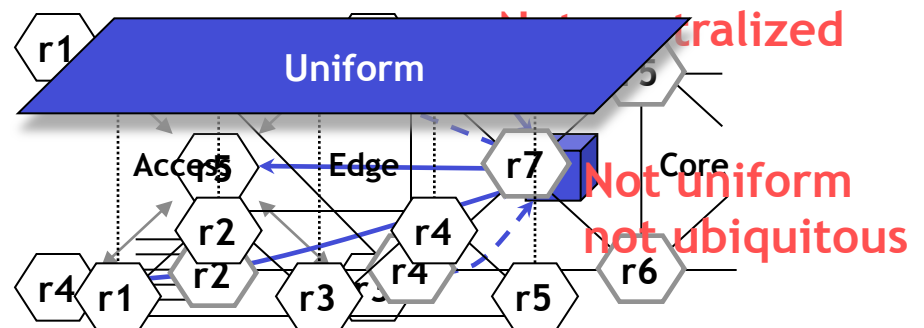
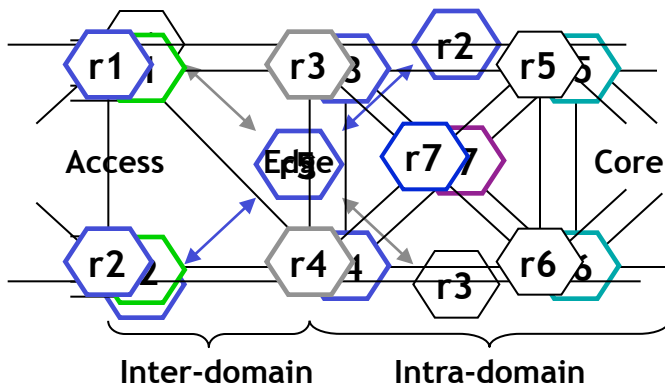
(Self-adaptive) Learning-based Control

Augment network systems (e.g. routers) with **learning component**



Guiding principles

- **Local view and decision** (no network global view or coordination): to ensure scalability and robustness
- **Modular** (no monolithic or unified framework): to ensure gradual development
- **Distribution** (no uniform or ubiquitous plane): to ensure organic deployment



LCCN Research Activity Positioning



Self-management

Self management: capability to operate and maintain systems and devices depending on the current system parameters

Unified framework and global coordination

Technique: e.g. policy-based management

LCCN Self-adaptive

Self-adaptive: ability of the system's components to adapt to changing environmental and running conditions over time

Distributed, modular, and local coordination

Technique: e.g. learning

Self-organizing

Self-organize: structure and functionality at the global level emerge solely from numerous interactions among lower-level components without any external or centralized control

Technique: e.g. biology, neuro-science

LCCN Initiative

- ❑ **One-line abstract:** learning-based control for network systems to automatically and timely adapt to network environment and running conditions over time
- ❑ **Description:** <<https://sites.google.com/site/lccngroup/>>
- ❑ **LCCN Meeting:** Wednesday March 30th at 8:00PM (Karlin I)

Goals (of this meeting)

- Community building and consensus building on problem statement and identified challenges
- Assess level of interest to initiate research on these problems/challenges
- Determine if IRTF is the right place to conduct research work to address (some of) them
- Estimate readiness for **IRTF Birds-of-a-Feather (BoF) for IETF 81**
- ❑ **Agenda:** <<https://sites.google.com/site/lccngroup/bof-description-and-agenda>>
- ❑ **Problem statement I-D:** draft-tavernier-irtf-lccn-problem-statement-01
- ❑ **Contact:** <<http://groups.google.com/group/lccn/>>