



KIRA – Scalable Zero-Touch Routing for Autonomous Control Planes

Roland Bless

Institute of Telematics, KIT



KIRA – Motivation

- NMRG context: Topic 1) self-driving/-managing networks
- KIRA provides an important foundation for that:
 - resilient control plane connectivity
 - e.g., for SDN, NFV, VIM, AI-based Control, Intent-based NM, OAM, ...
 - avoiding circular dependencies
 - support for inband, out-of-band, hybrid management/control
 - controllability of every networked device (even virtual ones)
- Existing solutions not scalable, zero-touch, or topology specific
- KIRA could be an alternative routing protocol for ANIMA's ACP (Autonomous Control Plane)
 - Offering advantages over RPL-ACP, e.g., built-in DHT
- Could be base for 6G Core infrastructure <https://ieeexplore.ieee.org/document/10175535>

SDN: Software Defined Networking,
NFV: Network Function Virtualization,
VIM: Virtual Infrastructure Management,
NM: Network Management,
OAM: Operations Administration, and Maintenance

KIRA – Features

- **Scalable**: connect 100,000s of nodes
 - ID-based, flat (i.e., no hierarchy or aggregation), no locators (no mapping!)
 - Trade-off: stretch (some routes longer than shortest path), tunable
 - Shortest paths to contacts in routing table
- **Zero-touch**: no configuration, self-organizing
 - Self-assigned addresses, no dependencies
 - Resilient control plane connectivity (IPv6)
 - Loop-free even during convergence
- Works well in and across **various topologies** (sparse and “dense”)
- Path-based forwarding (e.g., supports multi-path routing)

KIRA – Status

- First Internet-Draft

<https://datatracker.ietf.org/doc/draft-bleess-rtgwg-kira/>

- Update will follow

- **Running Code** (going to be released soon)

- Large Scale Simulations

- SDN-based Application for Ryu SDN Controller (Python)

- Forwarding Tier uses OpenvSwitch

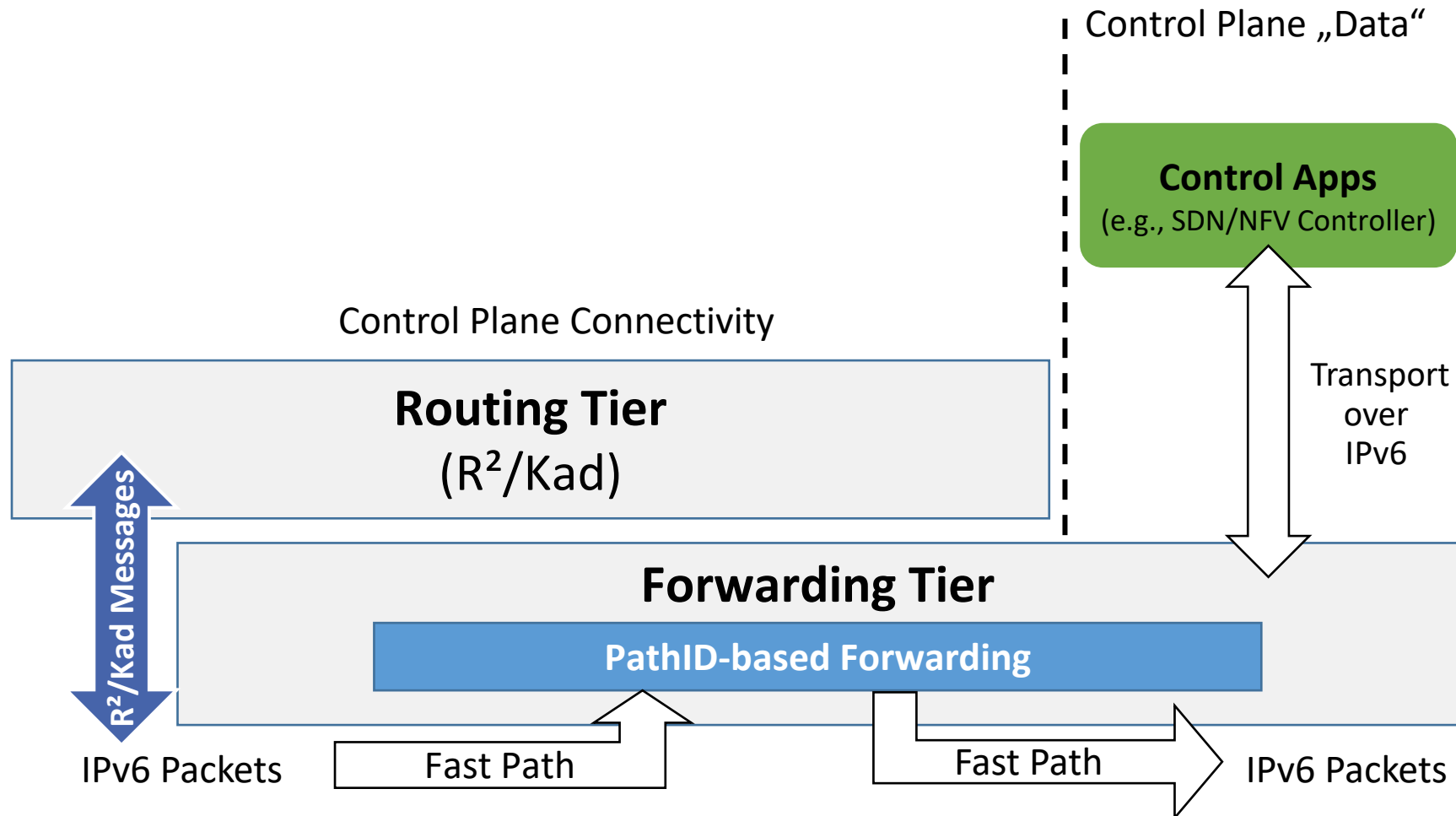
- Native Routing Daemon Linux (Rust)

- Forwarding Tier uses nftables

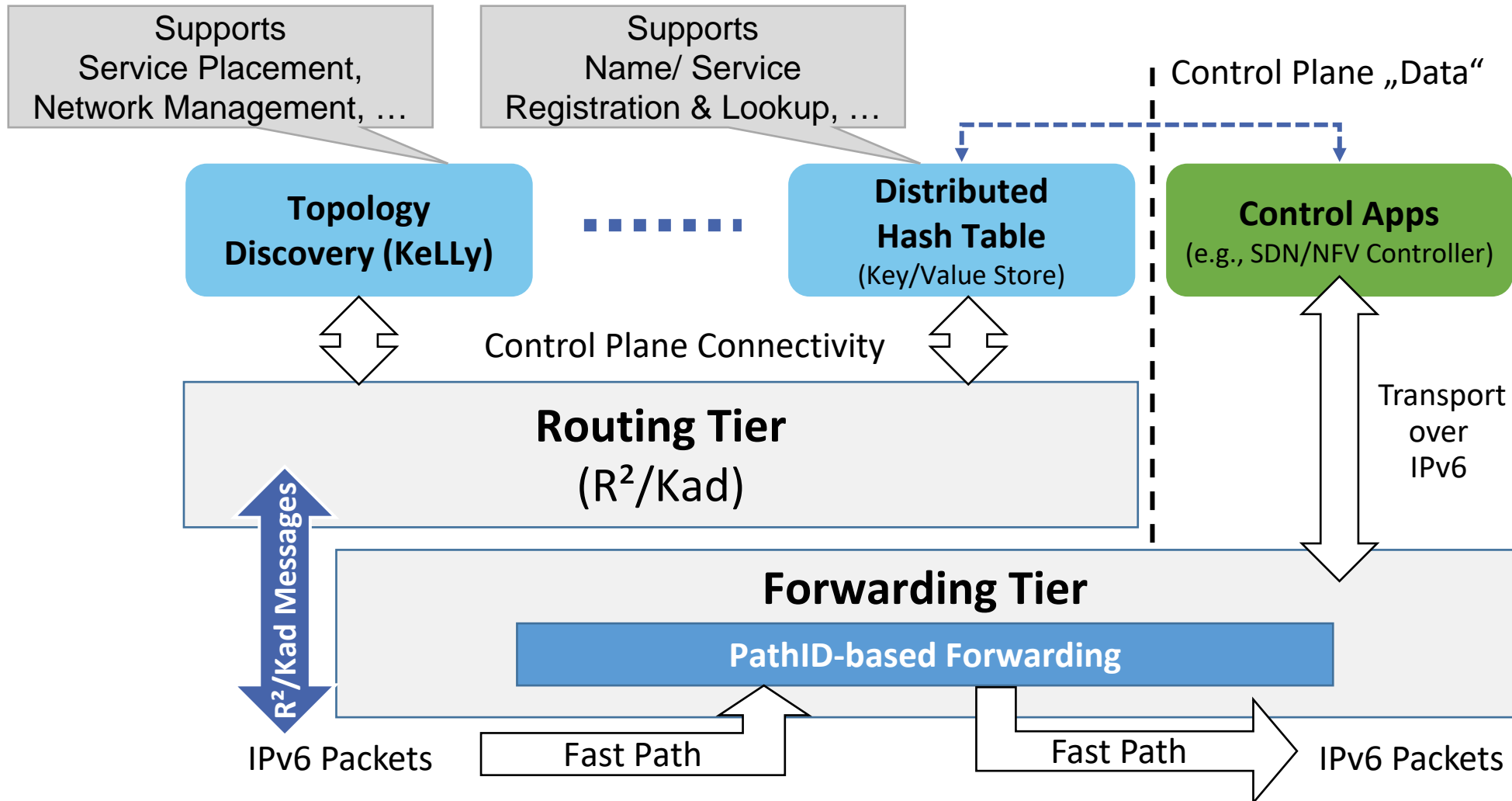


<https://s.kit.edu/KIRA>

Architecture

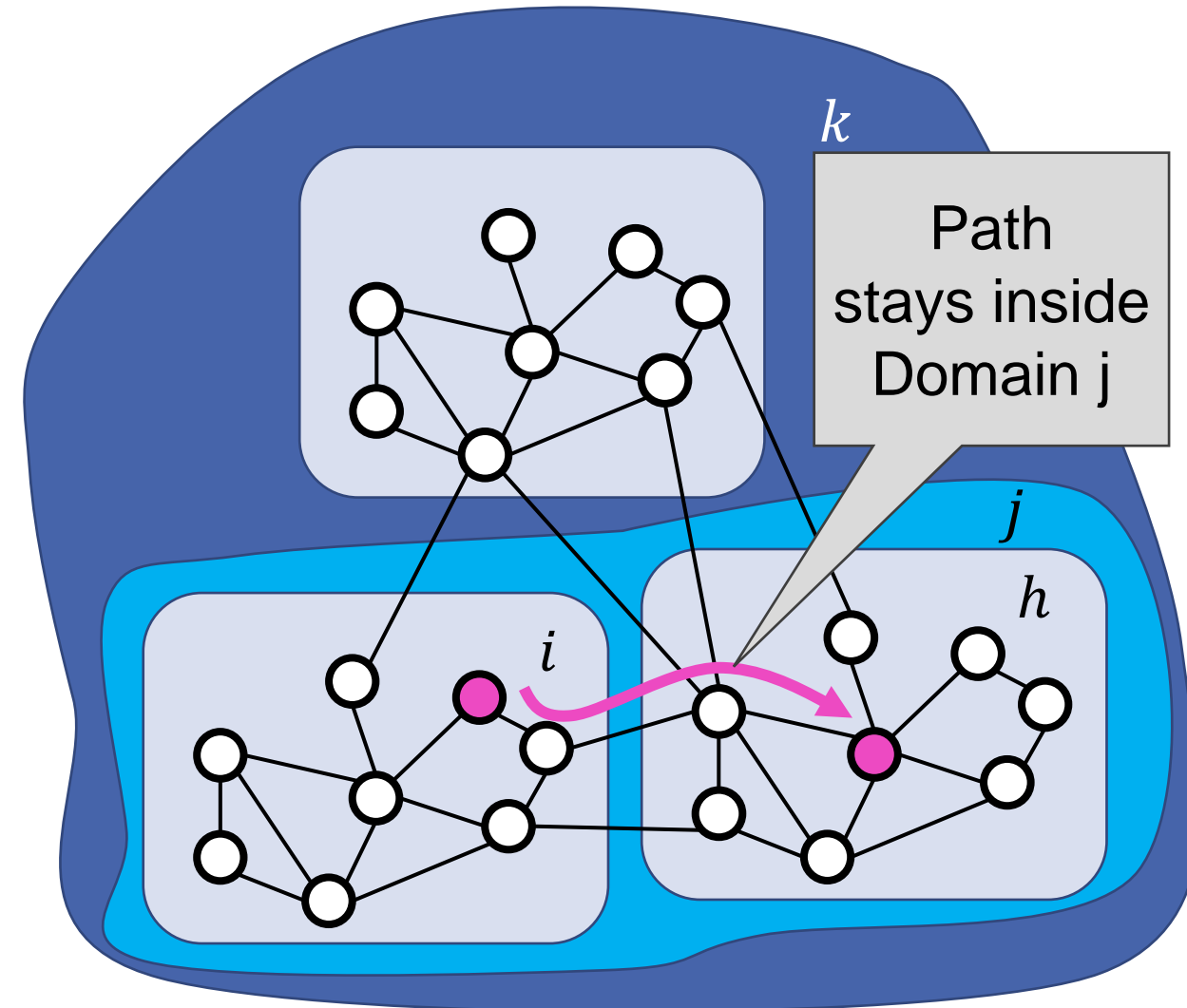


Architecture



KIRA – Further Features

- Domain Scopes
 - Global, Organizational, Topological
 - KIRA nodes keep their NodeID!
- End-system mode
- Multi-path routing
- Ongoing: Security



Why am I here?

- Make you aware of the approach/solution
- Get **feedback**
- Get **support**
- Get more ideas for...
 - **use cases**
 - e.g., telemetry data for AI, AI data transport
 - and **supporting services**
 - Multi-path, Multicast, QoS Support

that KIRA could support

