Semantic Routing

Requesting Your Help
draft-king-irtf-challenges-in-routing

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What are we trying to do?

- We're trying to understand the implications for the routing subsystem of "*Semantic Routing*"
- We do this by:
  - Cataloguing existing proposals
  - Cataloguing existing research projects
  - Formulating a set of research questions
- We are not trying to:
  - Say whether any semantic routing proposal is good or bad
  - Come up with any routing protocol solutions
- But, what on earth do you mean by "*Semantic Routing*"?

Routing on Additional Information

- Pre-history
  - Packets have a destination IP address
  - Routing finds the least cost path to the destination
- Routing has considered other information from the packet
  - DSCP
  - ECMP hashing on 5-tuple
  - IPv6 Flow Label
  - IPv6 Extension Headers
  - Etc.
- … “Preferential Routing”, “Policy-based Routing”, “Flow steering”

Semantic Addressing

- Encoding additional information into an IP address
  - That is, giving enhanced meaning to the bits of an IP address
- There may be a scope of applicability
  - The semantics might be used only within a domain
- To some extent we have done this already by assigning prefixes
  - Documentation addresses
  - Loopback addresses
  - Multicast address space
  - Private use addresses
  - IPv4-IPv6 encoding
  - Etc.
- But is that it?

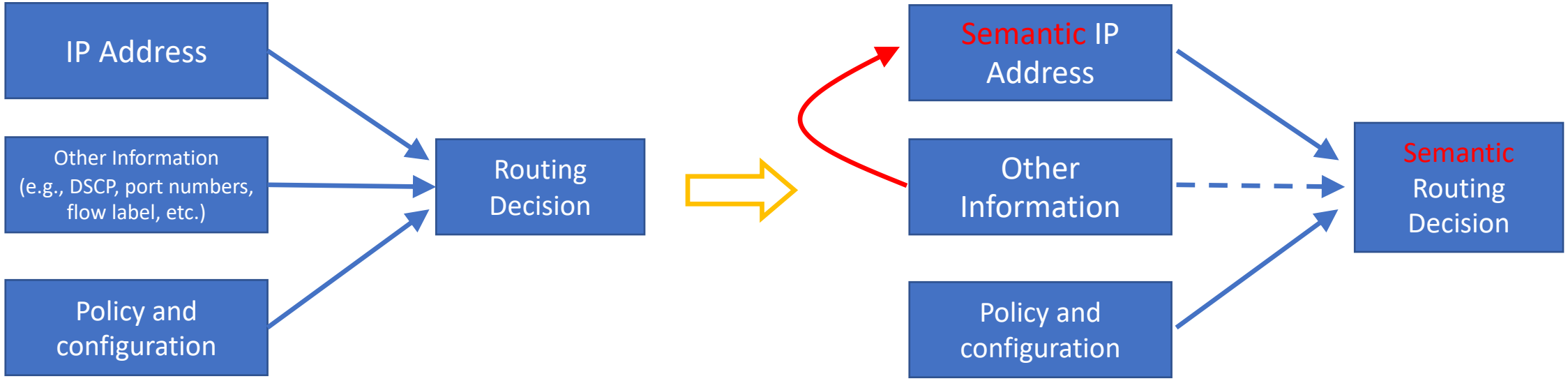
More Recent Semantic Address Proposals

1. Address things other than interfaces
   - For example, address network functions or end-point-processing
     - Such as SRv6 Network Programming (RFC 8986)
     - Direct addressing in SFC
     - Hybrid ICN (hICN)
2. Shorter (variable/flexible) addresses
   - Useful for constrained environments?
     - IoT
     - SRv6 SID stacks
3. Hierarchically scoped addresses
   - Scaling the global address table
   - Tying geolocation to IP addresses
   - Making “simpler” multi-domain routing
4. Encode additional information in some of the bits of an address
   - See draft-jiang-semantic-prefix for a survey

Semantic Routing – What Is It?

- Simply put…

  Routing on addresses that contain additional semantics
- Legacy nodes may need to “survive” semantic addressing
- New or enhanced nodes may be get additional routing function from semantic addresses



Prior Art

Routing using Semantic Addresses

Routing Research Questions for Semantic Addressing (WIP)

1. What is the scope of the semantic address proposal?
   - Global, backbone, overlay, domain, domain with gateway, …
2. What is the impact on the existing routing system?
   - Do protocols have to change? What happens if semantic addresses “escape”?
3. What path characteristics are mapped from the addresses?
   - What info does the network need to collect? How is it distributed?
4. Do we need new software and hardware?
   - What are the optimisation versus generalisation tradeoffs?
5. How does it scale?
   - Performance (convergence, on-wire), memory (routing table, other state)
6. Is multicast supported?
7. What needs to be standardised?
   - Why?

What Do We Want from You?

- Pointers to relevant work
  - Proposals for Semantic Addressing
  - Research into Semantic Routing
- Suggestions for additional research questions
  - Some initial thoughts
    - draft-jia-intarea-scenarios-problems-addressing
    - draft-king-irtf-challenges-in-routing
  - What could go wrong with routing?
  - What routing problems should people be researching?
  - What type of networks should people experiment with?
- Where to discuss this?
  - Obviously, you can email the authors direct
  - Mainly it's research work so irtf-discuss@ietf.org is appropriate
  - Possibly the ADs won't mind if we continue on routing-discussion@ietf.org