Directions for COIN

draft-kutscher-coinrg-dir-02

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Intention

• What does in-network really mean?
  • Exploring numerous (present and future) options

• Some thoughts on computing
  • Looking at code and its provisioning, execution, etc.

• What could/should COIN look at?
What does “in-network” really mean?
Lots of Computing “in the Network” Today

• SmartNICs
• Web servers
• CDNs
• Cloud platforms
• Note: Some forms of “Edge Computing” are merely about extending the cloud computing concept to specific hosts at the edge

• These approaches are applied (more or less) successfully today and do not need COIN research…
  • …but there is lots of engineering to be done in the IETF
Computing in the Network

• Do not require fixed locations of data and computation

• Can lay out processing graphs flexibly – meeting requirements optimally
  • Sometimes we can move functions (to be close to large data assets)
  • Sometimes we gradually move data where it is needed (e.g., where specific computations run)

• Conditions may change dynamically and constantly: network to adapt to application requirements, network conditions etc.

• Optimization based on application requirements & view of all relevant resources
This Draft

- Different types of in-network computing systems
- Examples: CFN-ICN & Akka
- Terminology
- Research Challenges
- Characterizing Computing in the Network vs. Packet Processing & Networked Computing
Version 02 Updates

• New example: Akka toolkit
  • Example of a widely used actor-based toolkit

• New research challenge: coordination
  • For services such as configuration management, service discovery, application state management and consensus building
  • Fundamental mechanisms well understood
  • But important aspect in most systems -- should be kept in mind

• Added references, misc. fixes
Authors’ View

(not explicitly pronounced in draft yet)

• Computing in the Network: More than just forwarding packets to nodes that happen host VMs or processes
  • Can be done today with various tools
• Embrace the idea of supporting distributed computing by leveraging networking concepts and mechanisms
  • Instead of building better pipes between processes
• Enhancing TCP to support in-network computing not promising
  • e2e (stream) model in conflict with hop-by-hop processing
  • Could possibly do better by rethinking requirements fundamentally
  • Security model unclear
  • Not sure a Research Group should fiddle with TCP
Suggestions for COIN

- Develop good understanding about different approaches, schools of thought
  - Unlikely there is only correct way…
- Develop criteria and taxonomy to discuss different
  - key concepts
  - use cases
  - ways of implementing typical features
- Possible research contribution
  - Understanding where new research is needed
  - Identifying possible commonalities and orthogonal approaches
Next Steps for the Draft

• Document more representative use cases
• Beef up related work towards diversity
  • Delineate from possibly related areas: edge computing, PEPs, …
  • Architectural work: NFN, + 2–3 more
  • Examples for joint resource management work
• Mention segment routing as another packet steering technology

• Some form of taxonomy to aid discussion in COINRG
• Outline and structure the space that COIN work considers/addresses
• Overall goal: help us understand problem – not so much prescribing solutions
Questions to Group and Chairs

- Future of this draft?
- Useful enough basis for framing scope and directions?