Emulating NDN-based Multimedia Delivery

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1. Low-Cost NDN Testbed using Banana Pi Routers



- Named Data Networking (NDN) [1] is an active research field.
- New proposals for NDN-related challenges (forwarding, caching, etc.) are evaluated either by theoretical analysis or by conducting simulations [2].

2. Network Architecture and Emulation Overlay



- Additional evaluations on physical hardware are desirable, exposing weak components, performance bottlenecks or further challenges.
- We provide a framework to realize a low-cost NDN-based testbed [3] using single board computers.
- All software components are open source and available at:

http://icn.itec.aau.at

3. Testbed Hardware Deployed at ITEC

Component	USD/Unit
20x BPI-R1	80 USD
20x Case for BPI-R1	15 USD
20x SSD (128GB)	50 USP
20x microSD (8GB)	4 USF



4. Scenario Configuration/Observation in the Web Browser





5.Testbed Capabilities: An Exemplary Evaluation of **Dynamic Adaptive Streaming in NDN**

Scenario Settings:

- Adaptive Multimedia Streaming in NDN
- 20 Nodes (12 Clients, 4 Servers, 4 Routers)
- Erdős–Rényi Graph (0.15 edge probability)
- Random Link Capacity (3000 4000kbps)
- **Random Link Delays** (1 5ms per hop)
- **Uniform Content Popularity**











- SVC-Encoded Multimedia Content (http://concert.itec.aau.at/SVCDataset/)
- **2 Adaptation Strategies** (Rate vs. Buffer)
- **5 Forwarding Strategies** (Broadcast, BestRoute, NCC, RFA, SAF)
- 20 Emulation Runs per Setting
- 48 Minutes Runtime per Emulation

References

[1] L. Zhang, A. Afanasyev, J. Burke, V. Jacobson, K. Claffy, P. Crowley, C. Papadopoulos, L. Wang, and B. Zhang, "Named Data Networking," ACM SIGCOMM CCR, vol. 44, no. 3, 2014. [2] S. Mastorakis, A. Afanasyev, I. Moiseenko, and L. Zhang, "ndnSIM 2.0: A new Version of the NDN Simulator for NS-3," Technical Report NDN-0005, http://named-data.net/publications/. [3] A. Afanasyev, J. Shi, B. Zhang, L. Zhang et al., NFD Developer's Guide, "NDN-0021, 2015.

Acknowledgement

This work was partially funded by the Austrian Science Fund (FWF) under the CHIST-ERA project CONCERT (A Context-Adaptive Ecosystem Under Uncertainty – http://concert-project.org), project number I1402 at Alpen-Adria Universität Klagenfurt.



Der Wissenschaftsfonds.

