

Resource Allocation in ICN

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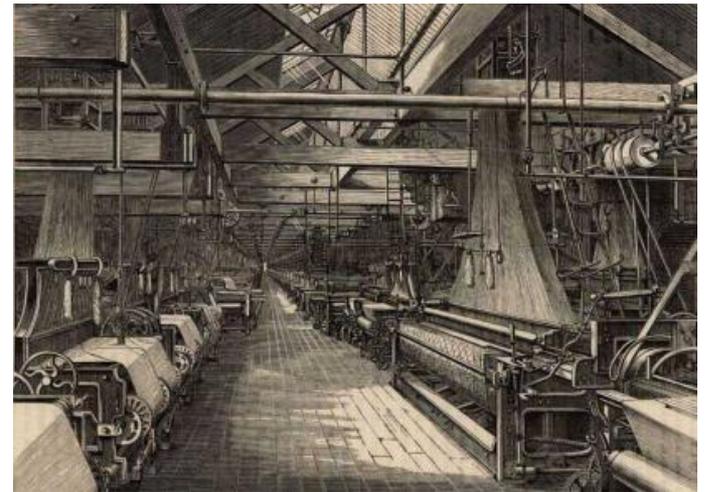
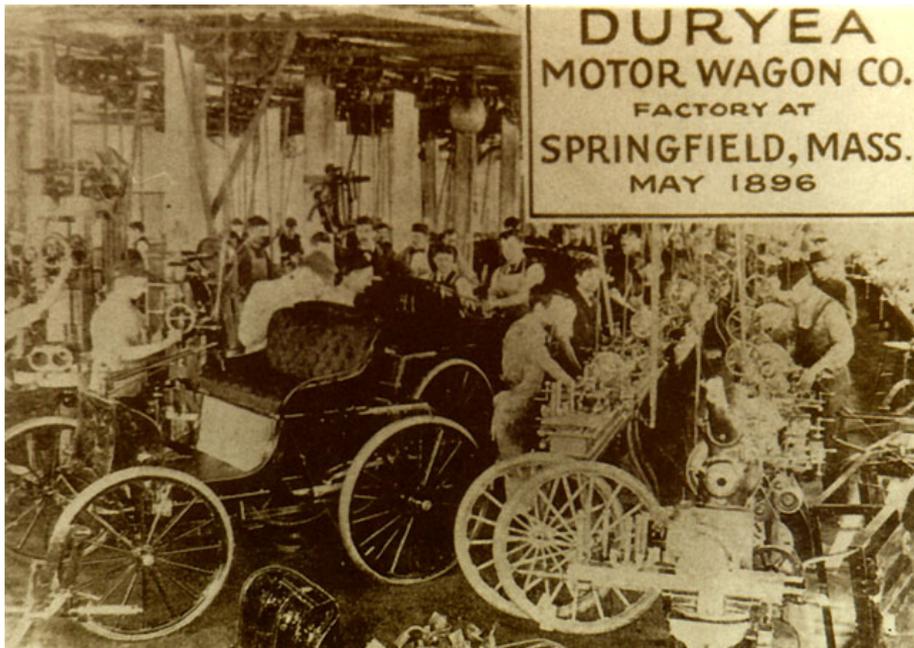


A Brief History of Networking

- **As suggested by Van Jacobson:**
 - Generation 1: the phone system
(focus on the wires)
 - Generation 2: the Internet
(focus on the endpoints)
 - Generation 3: dissemination
(focus on the data)

A different view: the industrial perspective

- **Circuit switched: resource allocated to a session, one-to-one mapping**



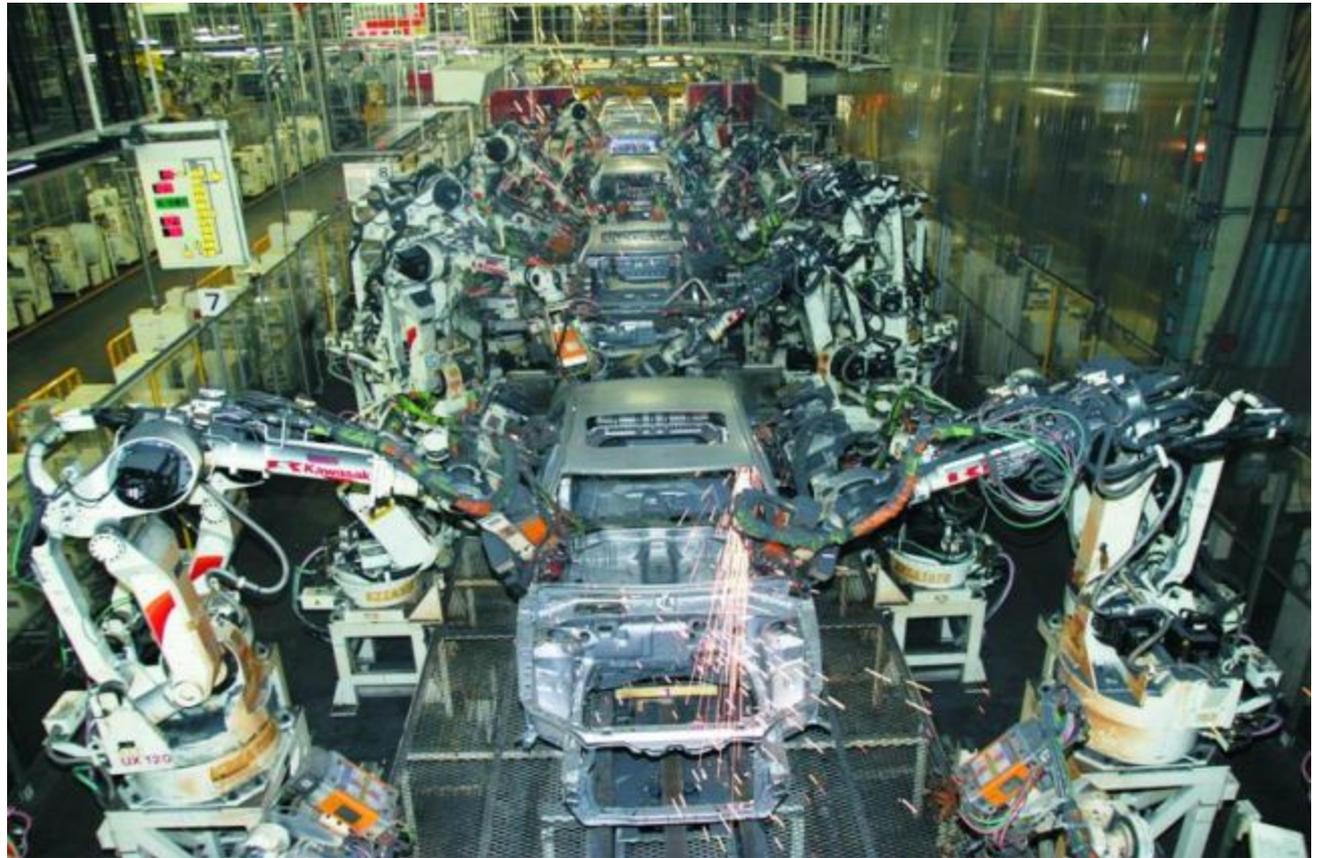
A different view: the industrial perspective

- Packet switched: each link focuses on one task (forwarding) and sees multiple flows (statistical multiplexing)



A different view: the industrial perspective

- Next: kanban manufacturing: just-in-time resource allocation

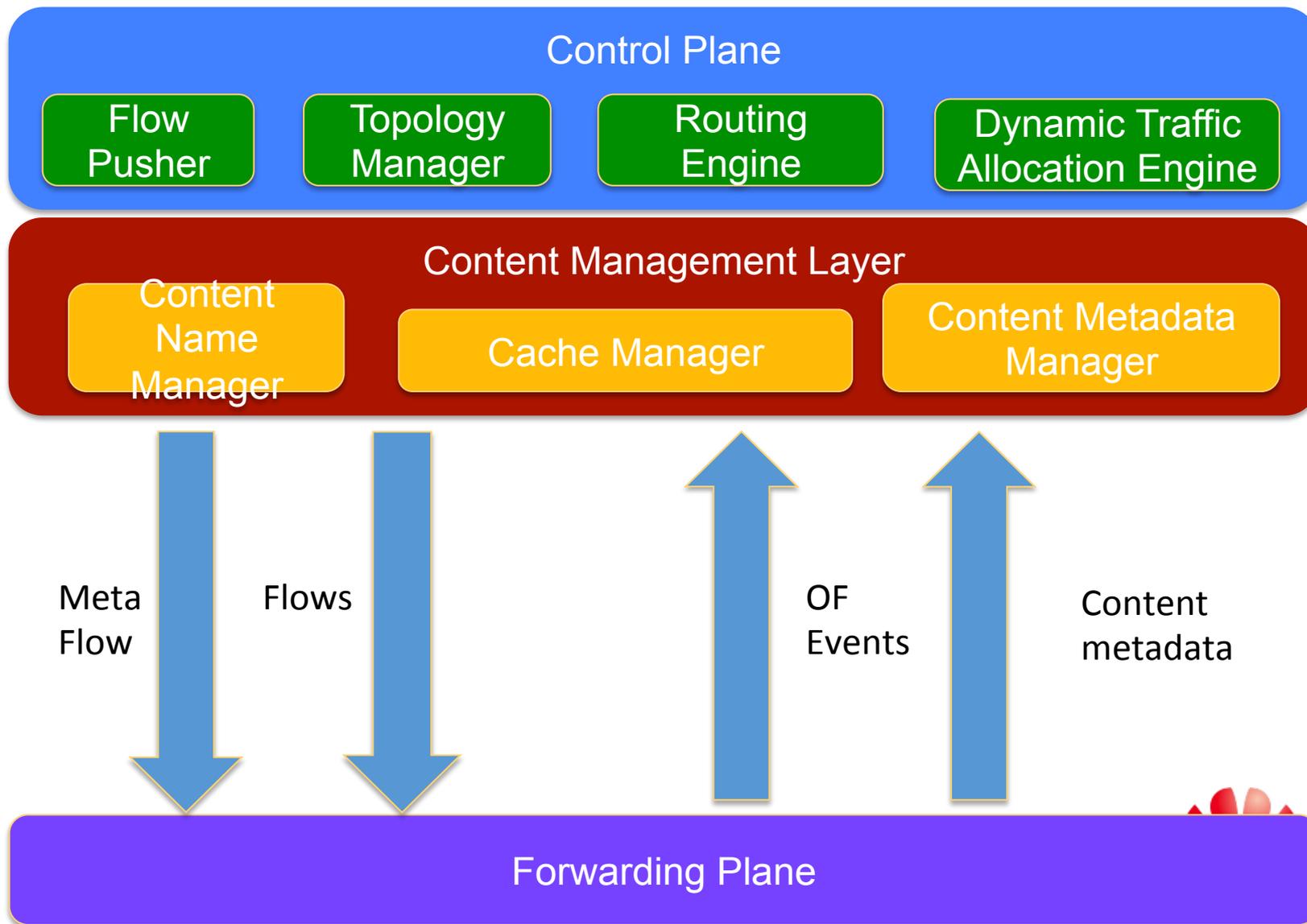


Fine, but how?

- **The *true* benefit of ICN...**
 - Caching: see 'less pain, most of the gain' paper
- **ICN:**
 - Address content by name, not by location
 - Content based routing
 - Unique mapping of name (network layer identifier) with content (application layer)

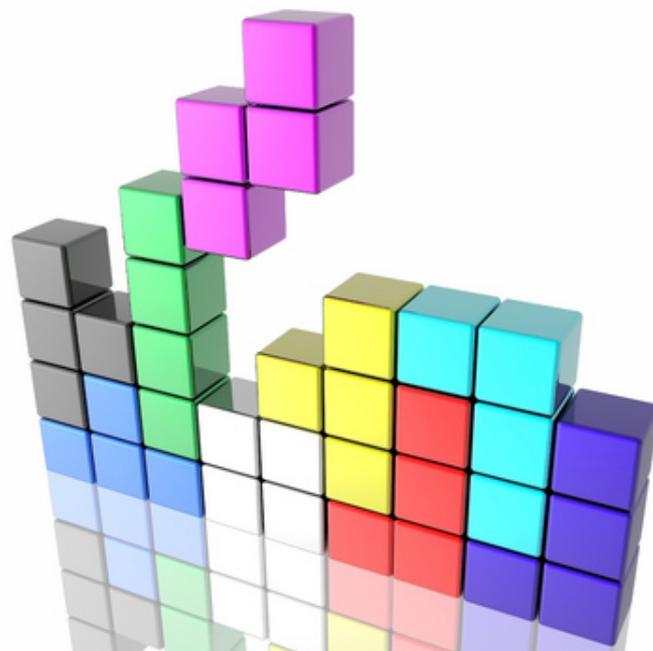
ICN Meta-data

- **Key difference of ICN and IP: can extract meta-data from the network that is content specific**
 - In particular, content size
 - Content size could be included as one potential meta-data in new naming architecture (parameterize names).
 - Can set a byte counter on a switch for a specific content
 - Can read content size from cache memory footprint
 - Can report this content size to a “controller”
 - So can associate extra context to content

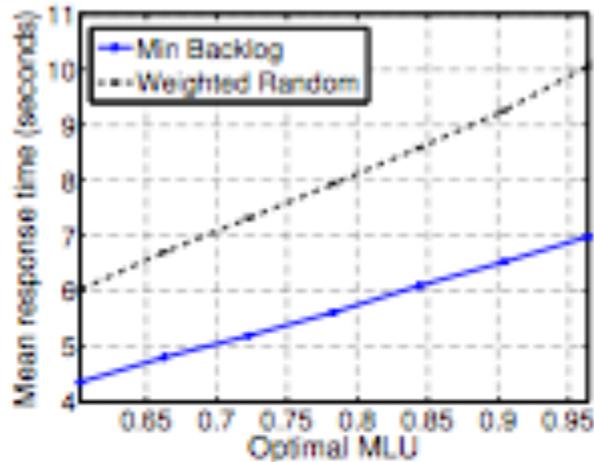


Fine-grained resource allocation

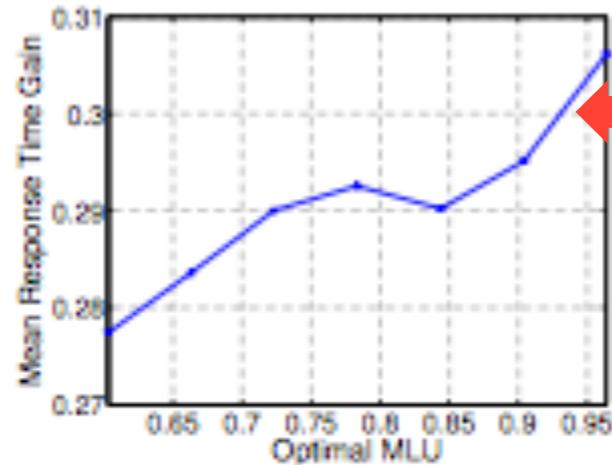
- **IP Flows: probabilistic**
- **Extremely difficult:**
 - NP complete problem
 - Dynamic TE complex to manage, operators don't like it
- **Basic heuristic:**
 - From content metadata, and from monitoring traffic, estimate backlog on a link
 - Assign next allocation to path with the lowest normalized link backlog



We tried it out...



(a) Mean response time comparison



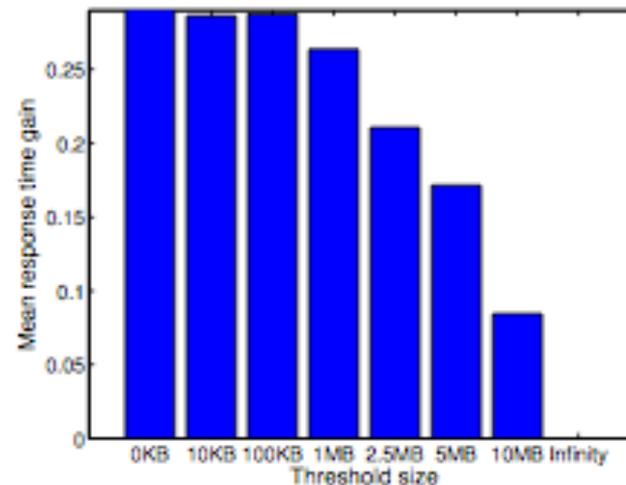
30% shorter

(b) Response time reduction gain

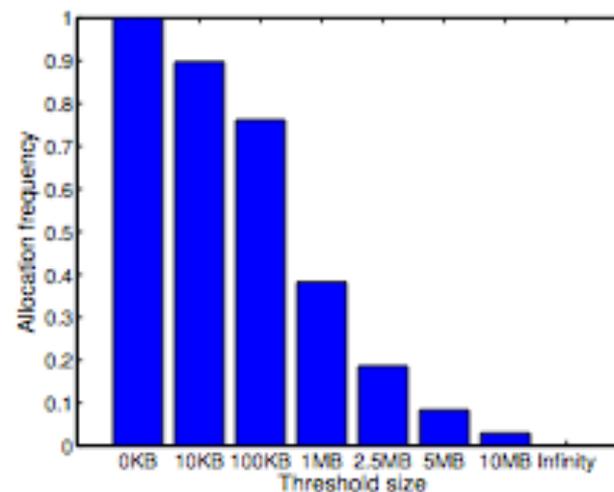
Fig. 3. Mean response time comparison for the two policies, with traffic matrices whose optimal MLU range from 0.6 towards 1.0, and content sizes following *Pareto* distribution.

Threshold based resource allocation

- Only elephant flows?
- Better policies could get better results?
- Popularity-based?



(a) Response time reduction gain



(b) Allocation frequencies

Fig. 5. Performance of thresholded MBP, with the traffic matrix whose optimal MLU is 0.783. The considered thresholds range from 10KB to 10MB. A threshold of 0 and infinity reduce to Min Backlog and Weighted Random, respectively.

Conclusion

- Next generation Internet will be more resource conscious for performance, economical, utilization, environmental reasons.
- Better way of defining how to request resource is required, and ICN (partially) answers this
- Better policies, need way to make it practical
- <http://arxiv.org/abs/1311.0951>

