Internet-of-Things on Internet

- NCTA predicts 50.1 billion IoT devices to be connected to the Internet by 2020 [1]
- IoT-based applications either perform local computation or offload it to centralized cloud
- Applications computation time can be limited by network delay for offloading

Industry 4.0 – Bosch APAS
Sensors: >100, 2D+3D camera
Use-case: Autonomous human collaboration
Time-constraint: Very high

Resource Grouping

- Data in Edge-Fog cloud is classified according to its workload
  e.g. phone cases & laptop cases as casing
- Resources with same workload in previous deployments have relevant data pre-cached
- Such resources are clustered in abstract groups for further deployment of that workload
  **Advantage** - 1) Cache hit maximization
  2) Data sharing within group

Edge-Fog Grouped Resources

Edge-Fog cloud [2] is a decentralized compute cloud architecture
- **Edge** Human-operated, voluntary compute devices
- **Fog** Compute capable network devices

Data Store Central database with no compute power
Task deployment algorithm (LPCF [2]) map application tasks on Edge-Fog resources while minimizing network and processing costs

Caching in Edge Clouds

- Retreiving required data from Data Store at computation time delays task completion
- Benefits of edge computing can be achieved only by limiting communication to central store
- Edge resources have **limited cache size**
- Task deployment does not consider computational resource's cached content

Algorithm

- Populate Caches
- Grouping Classifiers
- Task Deployment

Evaluation

- Implemented on Icarus
- 320 node topology
- 96*10^4 content items
- ~32 workload types
- Cache size ~10% content

Future Work

- Maximizing content sharing within a group?
- Computational content consistency to avoid updates on stale cached data?
- Communication model for content updation and advertising?

References


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