Broadcast Data Scheduling in Wireless Environment

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Outline

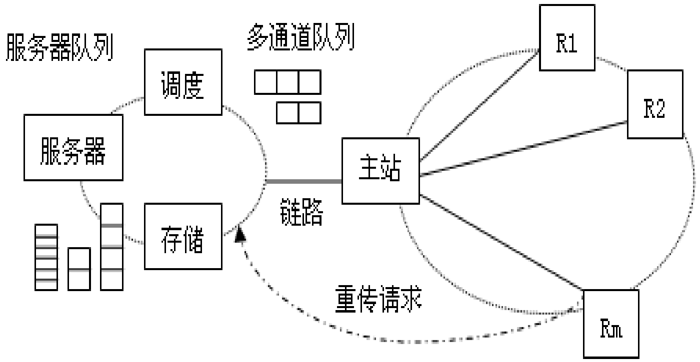
- Background
- System Model
- Algorithm Design
- Simulations
- Conclusion
- Q&A

Backround

- Requirement in application
  - Real-time data broadcast

    traffic information system,
    stock price, weather information
    and news distribution system.
  - Performance metric

    Low wait delay, fairness



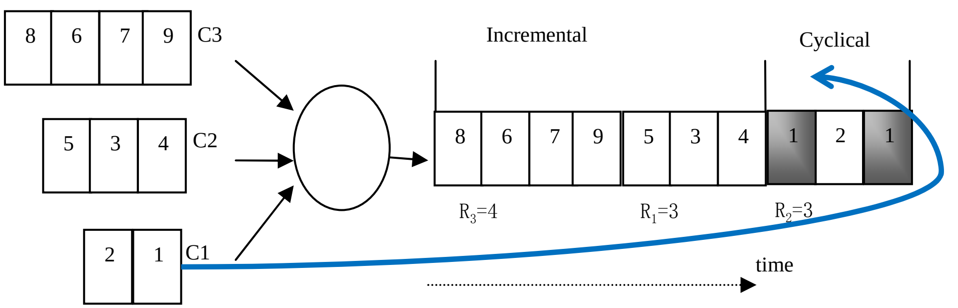
Backround

- Related work

Name	ideal	ref
FLAT	equal data allocation	[1]
$V^F K$	Skew data allocation	[2]
DP	partition data with dynamic programming	[3]
BH	hybrid push-pull scheduling	[5]
TSOA	Two-level scheduling	[6]

Our System Model

- Muticast push channel and one pull channel scheduling (ab. MP+P)



Performance metric

$$MCAED = \frac{1}{k}\sum_{1}^{k} \frac{1}{\Delta N_i}\sum_{i=1}^{\Delta N} w_i p_i + \sum_{j=1}^{N} \frac{\sum_{r_j \in R_j} w(r_j) p_j}{|R_j|}$$

System Model formulation definition

- Data need to delivery

$$D=\{d_1,d_2, \ldots,d_N\}$$

$$\Delta D = \{(n_1, l_1),(n_2, l_2),\ldots(n_m, l_m)\}$$

- scheduling model

$$S_k^1 \rightarrow F(R_\Delta(\Delta D, k), R_\pi(D), C(k+1, B))$$

Design algorithm

- Allocation data

  Picking up a data flow with maximum A_i and assigning it to a channel with minimum A_j.

- Permutation

  Sorting items in non increasing order of A_i . this step moves the scheduling towards the near optimization.

- Rate adjustment.

  Assigning total link bandwidth to each channel and determining rate of the broadcast program for each channel.

Rate adjustment

- Init rate

$$R_a(t) = \sum R_i(t) \times q_i(t)$$

- Dynamic rate

$$R_i(t) = R_i(t) + R_a(t)$$

Simulations

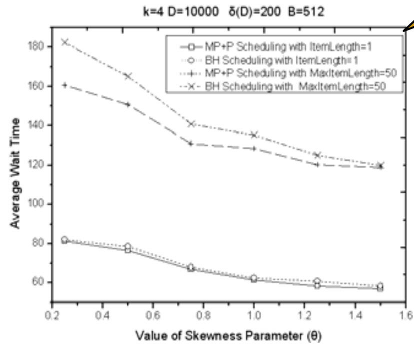
- ✓ **Network environment**
  512k satellite down link
- ✓ **Broadcast program**
  Mdt {filename,mulcast-add,send-rate,channel}

Table 1. Parameter and Value

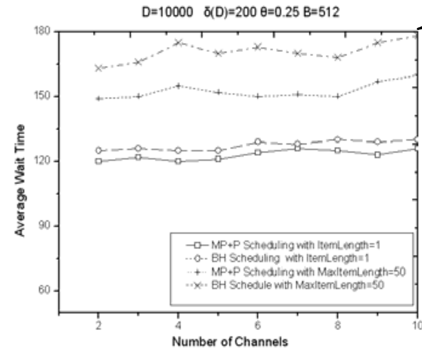
Parameter	Denotation	Value
Database size	*N*	10000
Channel numbers	*K*	3-10
Bandwidth	*B*	512
Access arrive rate	*λ*	10
data item length	*l*	1,25,50,75,100,125,150,175
Skew coefficient	*θ*	0.25,0.5,0.75,1,1.25,1.5

Simulations

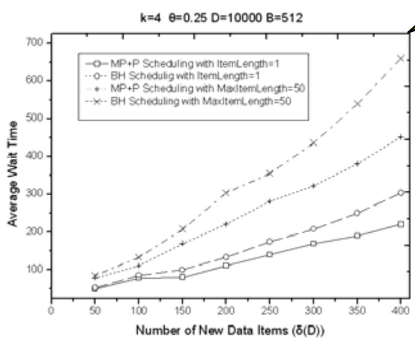
Skew
1.8% ,6.2%



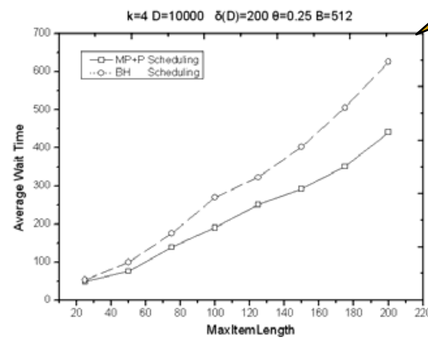
Channel
11.9% ,34.9%



Items
17.6% , 22.3%



Length
23.9%



Conlusion

1) Get a better approach for delivery bulk data

2) Present a model for incremental data disseminate

3) Design on-line algorithm to implement our model in real applications