Breaking Tie using Decimal Number Metric

- A Proposal for Shortest Path Bridging –

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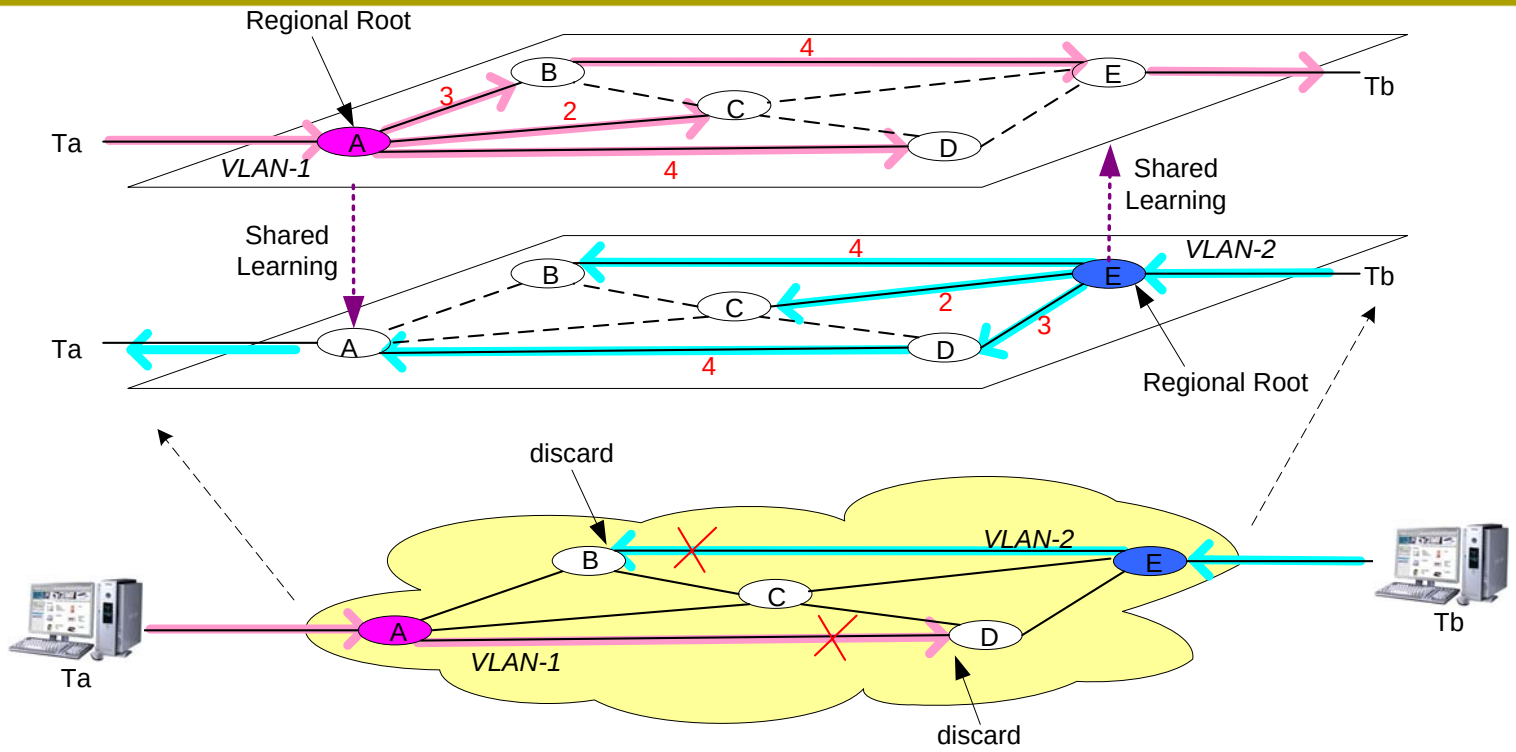
Issue of Equal Cost Paths in Shared VLAN Learning



- Bridge-**A** uses **VLAN-1**, and Bridge-**E** uses **VLAN-2**
- The path costs (A→B→E)=(E→D→A) are equal!!
  Cost(A→B→E)=3+4=**7**, Cost(E→D→A)=3+4=**7**

- After shared learning of **Ta, Tb,** bridges will discard frames of **Ta, Tb** because ..
  the path **Ta** ←→ **Tb** is not SYMMETRIC !!

Cost Metric of Unsigned Integer Number

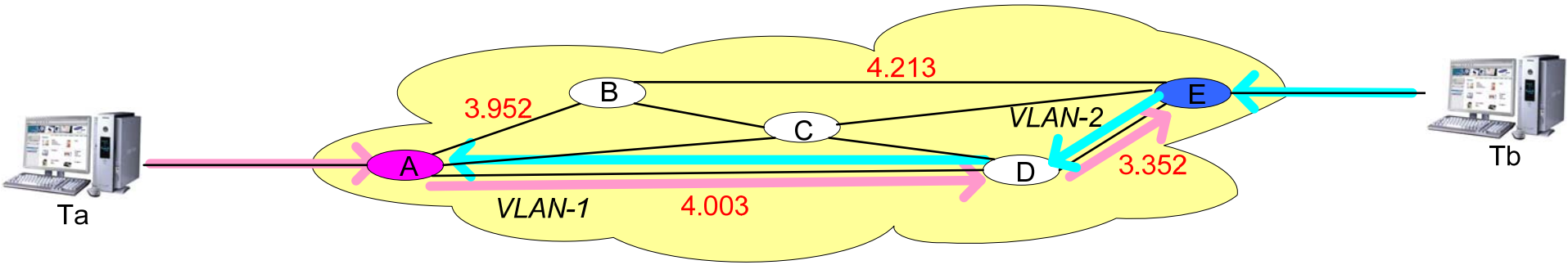
Table 13-3—Internal Port Path Costs

Parameter	Link Speed	Recommended value	Recommended range	Range
Internal Port Path Cost	<=100 Kb/s	200 000 000	20 000 000 – 200 000 000	1 – 200 000 000
	1 Mb/s	20 000 000	2 000 000 – 200 000 000	1 – 200 000 000
	10 Mb/s	2 000 000	200 000 – 20 000 000	1 – 200 000 000
	100 Mb/s	200 000	20 000 – 2 000 000	1 – 200 000 000
	1 Gb/s	20 000	2 000 – 200 000	1 – 200 000 000
	10 Gb/s	2 000	200 – 20 000	1 – 200 000 000
	100 Gb/s	200	20 – 2 000	1 – 200 000 000
	1 Tb/s	20	2 – 200	1 – 200 000 000
	10 Tb/s	2	1 – 20	1 – 200 000 000

(802.1Q-2006,p213)

- Bridges often use identical link cost to same speed links
- It is likely that there are many equal cost paths in heavily meshed network
  → But, what if we use all different link costs?

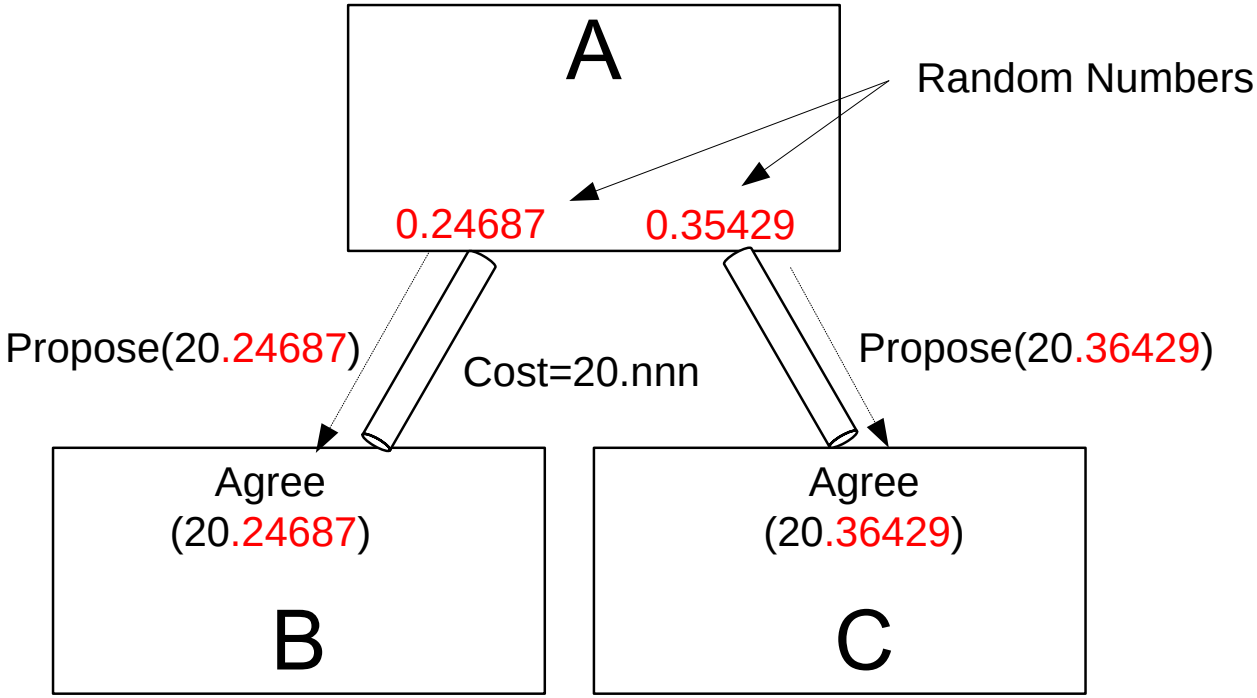
Making Non-Equal Cost Paths



- Use decimal number for cost calculation
- Randomize the decimal portion of link costs
- Now, VLAN-1 path and VLAN-2 path between **Ta,Tb** become identical because the minimum cost path is unique
  - Cost(A→B→E)=4.213+3.952= **8.165**
  - Cost(A→D→E)=4.003+3.352= **7.355** ← Minimum Cost

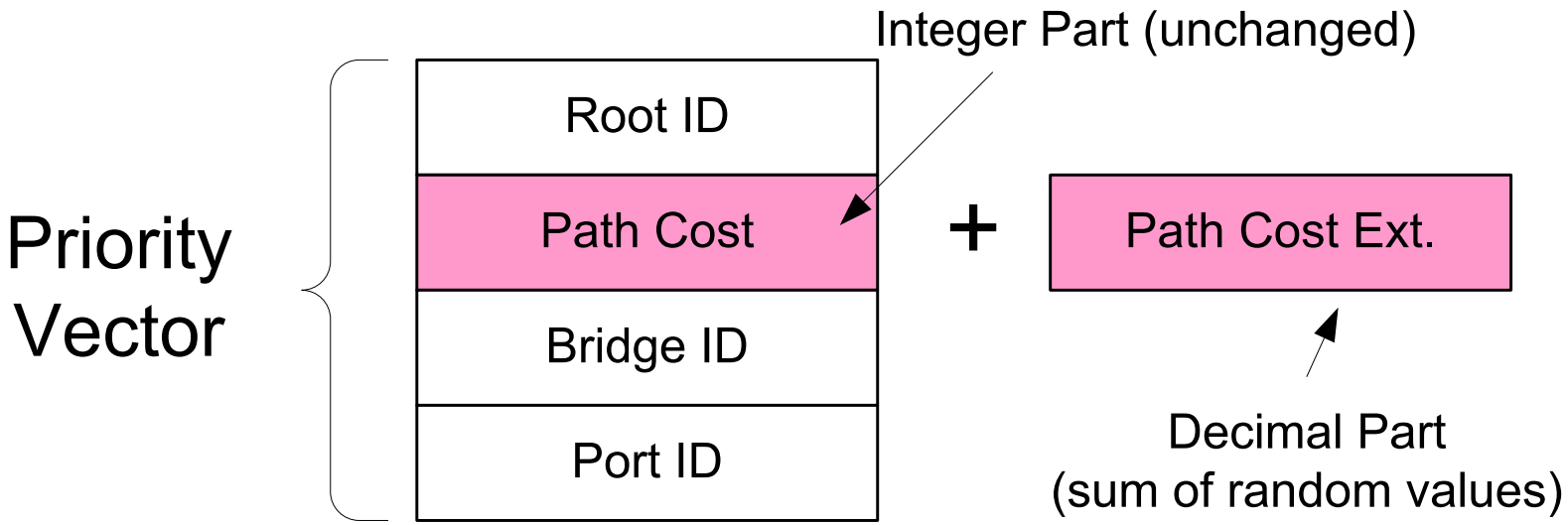
- Path Ta←→Tb become symmetric !!

Randomizing Decimal Part of Link Cost



- One of the peer bridge generate random decimal number (0<n<1) for each port
  → Use the number for decimal part of link cost
- Negotiate the decimal number link cost
- SPB supporting bridges use the decimal number metric for Spanning Tree calculation

BPDU Extension for SPB



- We can add **Path Cost Extension** Field which represents sum of decimal part of link costs

- Not all nodes need to support the extension field
  - → Only the nodes supporting SPB may participate in accumulation of decimals.
  - → If any one of decimal number is properly randomized, then the resulting path cost will be unique with high probability

Conclusion

- Decimal number metric will make root path cost unique with high probability
- If there's no equal cost, No tie-breaking is necessary
- Shortest Path Bridges will converge to symmetric path using existing (R/M)STP solution.

Question: Do we still need link-status routing protocol for SPB?