

Routing Trends

Routing growth continues to decelerate; analysis of 4Q trends

Industry Overview

Healthy growth in historical terms, yet below peak rates

The Service Provider (SP) routing market (ex-China) grew 5.1% YoY in 4Q22, in-line with the 6.2% growth recorded in 4Q21, but well below the peak rates of 12%-27% seen in early 2021. The Chinese routing market accounted for 20% of the global market, however most Western vendors do not sell into China, and we therefore exclude it from our analysis. The Core routing market generally underperforms Edge routing and we saw a similar trend in 4Q22 with Core routing declining -1.1% YoY vs. 7% growth in Edge. We expect the routing market to return to dismal growth, following a major growth cycle recorded in 2021/2022, which was driven by bandwidth demands, 5G-related projects, 400G deployments, and capacity additions of Cloud Titans and SPs in North America. We saw a glimpse of this decline in the recent quarter results of networking vendors, with Juniper SP revenue down -8% YoY and Cisco stating that SP orders were below seasonal rates. We note that between 2012-2020, the routing market exhibited almost no growth, with capacity demands absorbed by price erosion and product enhancements.

Bandwidth demand/service offerings driving Edge growth

The Edge routing market (~78% of revenue) is supported by both bandwidth demand and a large service element. Growth sharply accelerated from about a -3% average in 2019-2020 to 11.9% YoY in 2021, driven by 5G aggregation, DCI, traffic growth and new enterprise service offerings. Better component supplies pushed the growth up to 7% in 4Q22 vs. 1.5% in 4Q21, but we expect the market to slow to approx. 2%-2.5% annual growth as COVID-related buildouts and 5G projects begin to slow. On market share, Cisco's share continues to decline, going from 31.5% in 4Q21 to 29.6% in 4Q22. Juniper's share has declined over the last few years, from 15.4% in 2018 to 13.9% in 2021, however recovered to 15.5% in 4Q22. Nokia, the largest 4Q Edge player, remained relatively stable at 31.1%, and Huawei (ex-China) continues to lose share globally down from 19.2% in 4Q21 to 17.5% in 4Q22. Smaller players that only play in 5G aggregation, like Ericsson and Ciena, show share improvements, albeit from a low base, from 0.8% and nil in 4Q21, respectively, to 2% and 1.7% in 4Q22. We note that Arista participates through software modules on its switches and would not show up on share data.

Core routing remains challenged; -1.1% YoY growth

The core routing market is mostly driven by bandwidth demand, however we believe it remains challenged with price erosion outpacing bandwidth-related unit growth. This segment declined -1.1% YoY, which represents a major deceleration from its peak of 25.6% in 4Q21. Recent trends suggest long-term growth is moderating back to historical averages, yet 2023 might still be above the historical norm, supported by 400G deployments, demand at cloud providers, and capacity additions by Cable MSOs and SPs. Cisco has gained market share consistently over the last few years, growing from 44.2% market share in 2018 to 58.3% in the latest quarter. Juniper's market share in core routing continues to deteriorate, down from 23.7% and 24.8% in 4Q21/1Q22, respectively, to 19.4% in 4Q22. Like the Edge market, Huawei (ex-China) continues to lose share, down from 16.9% in 4Q21 to 15.4% in 4Q22, while Nokia grew its share from 3% to 4.8% in the same period.

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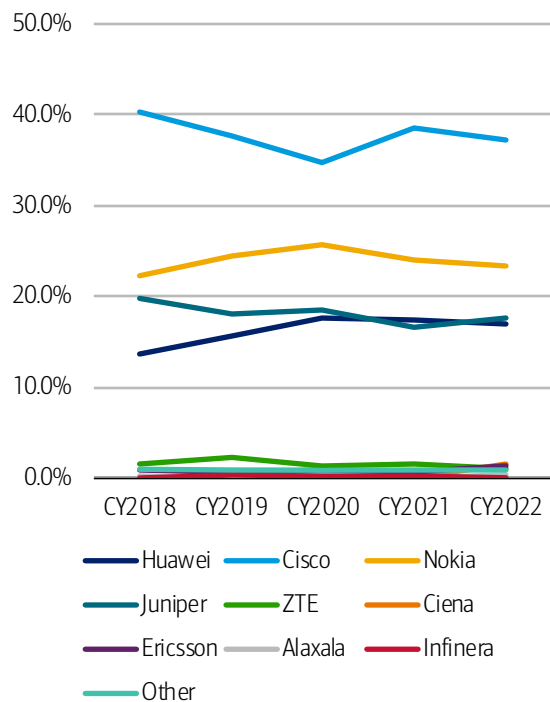
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Routing Market Overview

We present the total market data first, followed by the Core and Edge segments. Note: figures are ex-China.

Exhibit 1: Service Provider Routing Market Overview ex-China

Cisco lost market share from 38.5% in CY21 to 37.1% in CY22

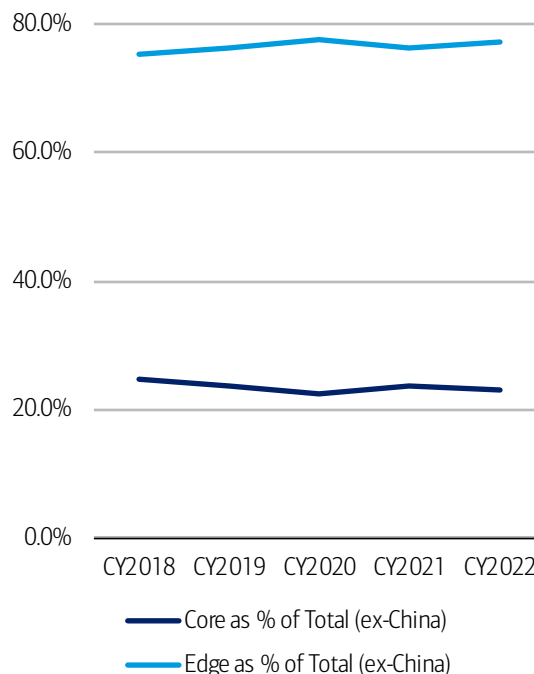


Source: Omdia

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Exhibit 2: Percentage of Total SP Routing Market ex-China

In CY22, edge routing grew to 77% of total SP routing

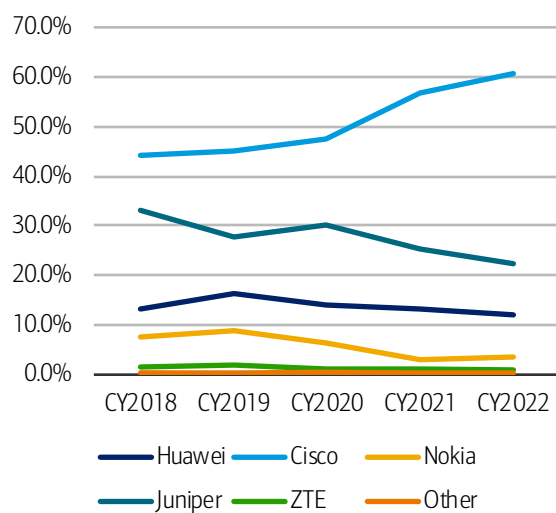


Source: Omdia

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Exhibit 3: Core Routing Market Overview ex-China

Juniper lost market share in CY22, while Cisco and Nokia gained share

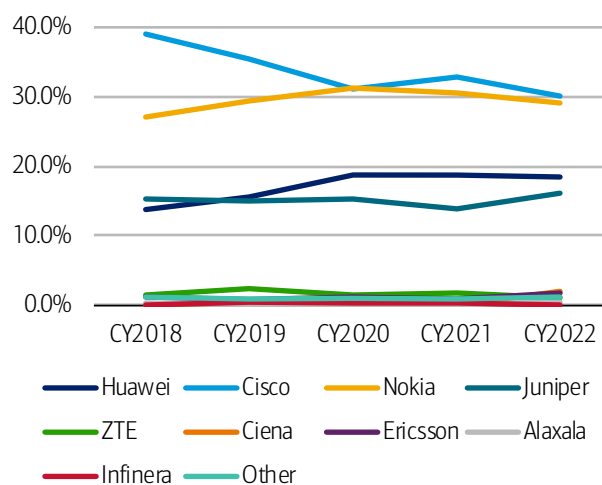


Source: Omdia

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Exhibit 4: Edge Routing Market Overview ex-China

Ciena and Ericsson grew to 2% and 1.7% market share in CY22, respectively



Source: Omdia

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**Exhibit 5: Snapshot of the Service Provider Routing Market ex-China**

The SP routing market grew 6.4% YoY in CY22, supported by 5g buildout and network capacity expansion

	1Q18	2Q18	3Q18	4Q18	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22	4Q22	CY2018	CY2019	CY2020	CY2021	CY2022
	18-Mar	18-Jun	18-Sep	18-Dec	19-Mar	19-Jun	19-Sep	19-Dec	20-Mar	20-Jun	20-Sep	20-Dec	21-Mar	21-Jun	21-Sep	21-Dec	22-Mar	22-Jun	22-Sep	22-Dec					
Total revenue (mn's)	\$2,021	\$2,149	\$2,258	\$2,540	\$2,104	\$2,255	\$2,216	\$2,366	\$1,733	\$2,099	\$2,126	\$2,553	\$2,213	\$2,355	\$2,384	\$2,713	\$2,291	\$2,534	\$2,606	\$2,851	\$8,969	\$8,940	\$8,511	\$9,665	\$10,282
QoQ	-15.3%	6.3%	5.1%	12.5%	-17.2%	7.2%	-1.7%	6.8%	-26.8%	21.1%	1.3%	20.1%	-13.3%	6.4%	1.2%	13.8%	-15.5%	10.6%	2.8%	9.4%	-7.3%	-0.3%	-4.8%	13.6%	6.4%
YoY	-8.9%	-14.4%	-11.7%	6.5%	4.1%	4.9%	-1.9%	-6.9%	-17.6%	-6.9%	-4.1%	7.9%	27.7%	12.2%	12.1%	6.2%	3.5%	7.6%	9.3%	5.1%					
REVENUE MARKET SHARE																									
Huawei	12.5%	15.7%	10.8%	15.4%	12.8%	15.7%	16.1%	17.8%	16.7%	17.6%	10.5%	24.2%	15.3%	18.0%	17.3%	18.7%	16.2%	19.5%	14.8%	17.1%	13.7%	15.7%	17.6%	17.4%	16.9%
Cisco	38.2%	39.0%	43.7%	40.1%	41.5%	37.9%	37.2%	34.5%	36.0%	36.3%	39.9%	28.3%	38.3%	39.2%	39.7%	36.9%	39.7%	35.0%	38.4%	35.8%	40.3%	37.7%	34.7%	38.5%	37.1%
Nokia	23.4%	21.7%	19.5%	24.3%	23.9%	24.1%	24.1%	25.8%	24.7%	24.0%	27.2%	26.5%	25.4%	23.0%	24.4%	23.7%	23.6%	21.9%	21.9%	25.4%	22.3%	24.5%	25.7%	24.1%	23.2%
Juniper	19.0%	21.6%	21.6%	17.2%	17.6%	18.4%	18.2%	17.8%	17.9%	19.0%	19.9%	17.5%	16.7%	16.0%	15.7%	17.8%	16.1%	17.8%	19.9%	16.3%	19.8%	18.0%	18.5%	16.6%	17.5%
ZTE	3.5%	0.0%	1.8%	0.8%	2.3%	2.0%	2.5%	2.3%	2.0%	1.0%	0.6%	1.7%	2.4%	2.0%	1.1%	1.2%	1.0%	0.8%	0.7%	1.6%	1.5%	2.3%	1.3%	1.6%	1.0%
Ciena	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	2.0%	1.7%	1.4%	0.0%	0.0%	0.0%	0.0%	1.5%
Ericsson	1.2%	1.0%	0.9%	0.8%	0.6%	0.6%	0.6%	0.7%	1.3%	0.9%	0.8%	0.7%	0.8%	0.7%	0.7%	0.6%	0.8%	1.5%	1.5%	1.5%	1.0%	0.6%	0.9%	0.7%	1.3%
Alaxala	0.2%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.1%	0.6%	0.6%	0.3%	0.0%	0.1%	0.0%	0.0%	0.1%	0.3%
Infinera	0.0%	0.0%	0.0%	0.3%	0.4%	0.4%	0.2%	0.4%	0.5%	0.3%	0.2%	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	0.3%	0.3%	0.2%	0.0%
Other	1.4%	0.4%	1.1%	1.0%	0.9%	0.9%	0.9%	0.9%	0.8%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	1.0%	0.9%	0.9%	0.9%	0.9%

Source: Omdia

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Exhibit 6: Core and Edge as Percentage of Total SP Routing Market ex-China

Edge routing continues to remain the largest segment of the total SP routing market, with 77% share in CY22

	1Q18	2Q18	3Q18	4Q18	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22	4Q22	CY2018	CY2019	CY2020	CY2021	CY2022
	18-Mar	18-Jun	18-Sep	18-Dec	19-Mar	19-Jun	19-Sep	19-Dec	20-Mar	20-Jun	20-Sep	20-Dec	21-Mar	21-Jun	21-Sep	21-Dec	22-Mar	22-Jun	22-Sep	22-Dec					
Core as % of Total (ex-China)	23.2%	26.9%	26.5%	22.5%	26.1%	23.5%	22.8%	22.4%	23.8%	23.3%	23.9%	19.6%	24.2%	23.8%	23.4%	23.1%	25.6%	22.4%	22.5%	21.8%	24.7%	23.6%	22.4%	23.6%	23.0%
Edge as % of Total (ex-China)	76.8%	73.1%	73.5%	77.5%	73.9%	76.5%	77.2%	77.6%	76.2%	76.7%	76.1%	80.4%	75.8%	76.2%	76.6%	76.9%	74.4%	77.6%	77.5%	78.2%	75.3%	76.4%	77.6%	76.4%	77.0%

Source: Omdia

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Exhibit 7: Snapshot of the Core Routing Market ex-China

Core routing was 23% of the total market in CY22, up 3.5% YoY

	1Q18	2Q18	3Q18	4Q18	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22	4Q22	CY2018	CY2019	CY2020	CY2021	CY2022
	18-Mar	18-Jun	18-Sep	18-Dec	19-Mar	19-Jun	19-Sep	19-Dec	20-Mar	20-Jun	20-Sep	20-Dec	21-Mar	21-Jun	21-Sep	21-Dec	22-Mar	22-Jun	22-Sep	22-Dec					
Total revenue (mn's)	\$468	\$579	\$598	\$572	\$548	\$530	\$505	\$529	\$412	\$490	\$508	\$500	\$536	\$560	\$557	\$628	\$586	\$569	\$585	\$621	\$2,217	\$2,112	\$1,910	\$2,281	\$2,360
QoQ	-14.9%	23.7%	3.2%	-4.3%	-4.2%	-3.4%	-4.7%	4.9%	-22.2%	19.0%	3.8%	-1.7%	7.3%	4.4%	-0.5%	12.6%	-6.7%	-2.9%	2.9%	6.1%					
YoY	-6.6%	-9.4%	-3.5%	4.1%	17.2%	-8.5%	-15.5%	-7.5%	-24.9%	-7.5%	0.7%	-5.6%	30.2%	14.3%	9.6%	25.6%	9.3%	1.6%	5.0%	-1.1%	-4.0%	-4.7%	-9.6%	19.4%	3.5%
REVENUE MARKET SHARE																									
Huawei	12.8%	16.1%	10.6%	13.8%	11.5%	19.5%	16.4%	18.0%	13.4%	11.4%	14.1%	17.3%	10.3%	12.0%	12.5%	16.9%	9.6%	12.2%	10.7%	15.4%	13.3%	16.3%	14.1%	13.1%	12.0%
Cisco	42.3%	41.8%	46.5%	45.7%	51.9%	39.6%	43.5%	44.6%	49.9%	48.5%	49.2%	43.4%	57.9%	58.2%	56.7%	55.0%	61.8%	59.6%	63.2%	58.3%	44.2%	45.0%	47.7%	56.8%	60.7%
Nokia	8.3%	6.9%	6.4%	9.1%	7.9%	8.7%	9.0%	9.7%	8.3%	7.9%	4.1%	5.9%	3.0%	2.8%	3.1%	3.0%	2.7%	2.8%	4.0%	4.8%	7.6%	8.8%	6.4%	3.0%	3.6%
Juniper	32.1%	35.2%	34.9%	29.9%	26.4%	30.2%	28.7%	24.9%	26.0%	31.0%	31.8%	30.9%	26.3%	25.5%	26.5%	23.7%	24.8%	24.4%	21.0%	19.4%	33.1%	27.5%	30.1%	25.4%	22.3%
ZTE	4.0%	0.0%	1.2%	1.0%	1.8%	1.5%	1.9%	2.4%	1.8%	0.8%	0.4%	2.1%	2.1%	1.1%	0.8%	1.1%	0.6%	0.6%	0.6%	1.7%	1.4%	1.9%	1.2%	1.2%	0.9%
Other	0.5%	0.0%	0.4%	0.4%	0.5%	0.4%	0.4%	0.5%	0.4%	0.4%	0.5%	0.5%	0.4%	0.4%	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%	0.3%	0.4%	0.4%	0.4%	0.4%

Source: Omdia

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Exhibit 8: Snapshot of the Edge Routing Market ex-China

The edge routing market grew 7.3% in CY22, supported by continued capex spending by SPs and cable companies

	1Q18	2Q18	3Q18	4Q18	1Q19	2Q19	3Q19	4Q19	1Q20	2Q20	3Q20	4Q20	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22	4Q22	CY2018	CY2019	CY2020	CY2021	CY2022
	18-Mar	18-Jun	18-Sep	18-Dec	19-Mar	19-Jun	19-Sep	19-Dec	20-Mar	20-Jun	20-Sep	20-Dec	21-Mar	21-Jun	21-Sep	21-Dec	22-Mar	22-Jun	22-Sep	22-Dec					
Total revenue (mn's)	\$1,553	\$1,570	\$1,661	\$1,968	\$1,556	\$1,725	\$1,711	\$1,836	\$1,321	\$1,609	\$1,618	\$2,054	\$1,677	\$1,795	\$1,827	\$2,085	\$1,706	\$1,965	\$2,021	\$2,230	\$6,752	\$6,828	\$6,601	\$7,384	\$7,922
QoQ	-15.4%	1.1%	5.8%	18.5%	-20.9%	10.9%	-0.8%	7.3%	-28.1%	21.8%	0.5%	27.0%	-18.4%	7.1%	1.7%	14.1%	-18.2%	15.2%	2.8%	10.4%					
YoY	-9.6%	-16.1%	-14.3%	7.2%	0.2%	9.9%	3.0%	-6.7%	-15.1%	-6.7%	-5.5%	11.8%	26.9%	11.6%	12.9%	1.5%	1.7%	9.5%	10.6%	7.0%	-8.3%	1.1%	-3.3%	11.9%	7.3%
REVENUE MARKET SHARE																									
Huawei	12.4%	15.5%	10.9%	15.8%	13.2%	14.6%	16.0%	17.7%	17.7%	19.5%	9.3%	25.8%	16.9%	19.8%	18.8%	19.2%	18.5%	21.6%	16.0%	17.5%	13.8%	15.5%	18.6%	18.7%	18.4%
Cisco	36.9%	37.9%	42.7%	38.5%	37.8%	37.4%	35.4%	31.6%	31.7%	32.6%	36.9%	24.6%	32.1%	33.3%	34.5%	31.5%	32.1%	27.9%	31.2%	29.6%	39.0%	35.4%	31.0%	32.8%	30.1%
Nokia	27.9%	27.2%	24.2%	28.7%	29.6%	28.8%	28.6%	30.5%	29.8%	28.9%	34.5%	31.5%	32.5%	29.3%	30.9%	29.9%	30.7%	27.5%	27.1%	31.1%	27.1%	29.4%	31.3%	30.6%	29.1%
Juniper	15.1%	16.6%	16.8%	13.5%	14.5%	14.7%	15.1%	15.7%	15.4%	15.3%	16.1%	14.3%	13.6%	13.1%	12.4%	16.0%	13.1%	15.9%	19.6%	15.5%	15.4%	15.0%	15.2%	13.9%	16.1%
ZTE	3.4%	0.0%	2.0%	0.8%	2.5%	2.1%	2.7%	2.2%	2.1%	1.1%	0.6%	1.6%	2.5%	2.2%	1.2%	1.2%	1.1%	0.9%	0.7%	1.6%	1.5%	2.4%	1.4%	1.8%	1.1%
Ciena	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	2.6%	2.1%	1.7%	0.0%	0.0%	0.0%	0.0%	2.0%
Ericsson	1.6%	1.4%	1.3%	1.0%	0.8%	0.8%	0.8%	0.8%	1.7%	1.2%	1.1%	0.9%	1.0%	0.9%	0.9%	0.8%	1.0%	1.9%	1.9%	2.0%	1.3%	0.8%	1.2%	0.9%	1.7%
Alaxala	0.3%	0.1%	0.3%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.1%	0.8%	0.7%	0.3%	0.0%	0.2%	0.0%	0.0%	0.1%	0.5%
Infinera	0.0%	0.0%	0.0%	0.4%	0.5%	0.5%	0.3%	0.5%	0.6%	0.4%	0.3%	0.2%	0.3%	0.2%	0.2%	0.2%	0.1%	0.0%	0.0%	0.0%	0.1%	0.4%	0.4%	0.2%	0.0%
Other	1.7%	0.6%	1.3%	1.1%	1.1%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	0.9%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.2%	1.0%	1.0%	1.0%	1.0%

Source: Omdia

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Glossary

- DCI = Data Center Interconnect
- MSO = Multiple System Operator
- SP = Service Provider



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Important Disclosures

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Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster ^{R1}
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

^{R1} Ratings dispersions may vary from time to time where BofA Global Research believes it better reflects the investment prospects of stocks in a Coverage Cluster.

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