

Server & Enterprise Software

Where are we trading now: Looking for drivers and laggards

Industry Overview

What people are talking about

Our software coverage universe rose 2.1% w/w (Nasdaq +2.6%), driving the EV/FCF/Growth multiple higher to 1.8x (versus historical median range of 1.5x – 2x). Key client questions include **1)** the potential valuation ceiling, and **2)** which companies are likely to be laggards in this round of expansion. We are receiving questions on Microsoft F2Q Azure/Office growth drivers and AI metrics disclosure for Azure/Office. We expect minimal disclosure at this early stage but note that investor expectations likely decreased following Adobe's disappointing FY24 guidance that included Firefly pricing below expectations. Lastly, we note rising client interest in SMID cap and xCaaS software names, such as Unity, GitLab and Zoom.

Infrastructure saw the largest multiple expansion w/w

We examine software valuation by category. On an EV/NTM Sales basis, the Infrastructure software group saw the largest multiple expansion w/w (+4.5%), with the Design software group seeing the largest expansion relative to the 5-year median (+8.2%). On an EV/NTM FCF basis, the Infrastructure software group saw the largest multiple expansion w/w (+4.3%), with the Security software group having the largest multiple expansion relative to the 5-year median (+11.3%).

Exhibit 1: Infrastructure software saw the largest EV/NTM Sales expansion w/w, led by GitLab

Software multiple expansion/contraction by category

Category	EV/NTM Sales				EV/NTM FCF			
	Multiple		% Change		Multiple		% Change	
	Current	5-yr median	1 wk	5-yr median	Current	5-yr median	1 wk	5-yr median
Collaboration	5.8x	7.3x	2.9%	-19.5%	29.7x	17.8x	2.2%	NA
Communication	2.5x	7.7x	1.7%	-68.2%	26.2x	32.9x	-1.5%	-20.5%
CRM	5.1x	8.6x	0.6%	-40.4%	39.4x	46.0x	0.2%	-14.5%
Design	10.5x	9.7x	3.0%	8.2%	38.6x	35.0x	2.7%	10.4%
ERP & Back Office	5.3x	7.7x	2.8%	-31.0%	39.1x	42.6x	3.6%	-8.2%
HCM	6.5x	9.8x	1.6%	-34.0%	43.4x	48.2x	2.0%	-9.9%
Infrastructure	7.8x	10.6x	4.5%	-26.6%	42.9x	42.5x	4.3%	0.9%
Security	8.2x	9.0x	3.3%	-8.7%	33.7x	30.2x	2.2%	11.3%
Vertical	6.3x	7.9x	1.5%	-20.3%	37.6x	42.0x	0.6%	-10.5%

Source: BofA Global Research estimates for companies under coverage, Bloomberg consensus for companies not under coverage. Stocks included may not be under BofA software coverage. See appendix.

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Within the report:

- Historical software valuation trends (Exhibit 2 – Exhibit 6)
- Software stock performance overview (Exhibit 7)
- Software coverage comp sheet (Exhibit 8 – Exhibit 10)
- Software valuation by category (Exhibit 11 – Exhibit 12)
- See the Appendix for a mapping of software companies by category, as well as the stock performance of individual companies

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WTD=week-to-date

QTD=quarter-to-date

YTD=year-to-date

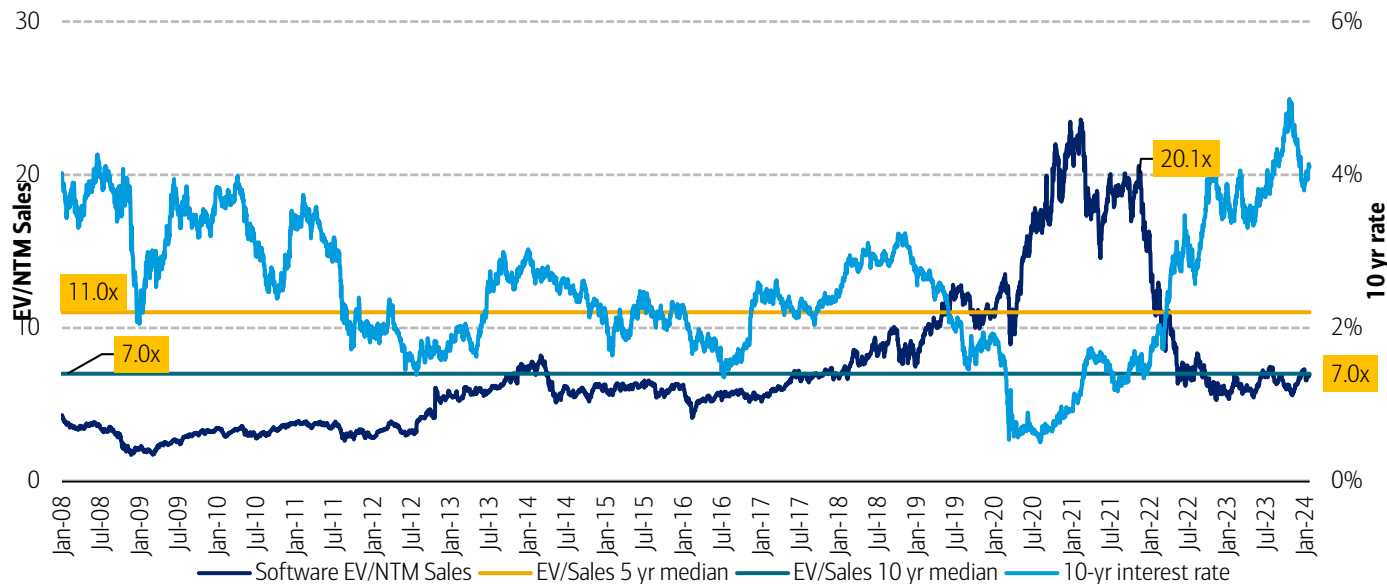
xCaaS= experience Communications
as a Service

Historical Software Valuation Trend

On an EV/NTM Sales basis, our coverage group is trading at 7.0x, -65% vs the '21 peak of 20.1x. Our coverage group's current multiple is -36% from the 5-year median of 11.0x and on par with the 10-year median of 7.0x.

Exhibit 2: EV/NTM Sales multiples remain below the 5-yr median though on par with the 10-yr median

EV/NTM Sales versus 10-year interest rate - 2008 to date

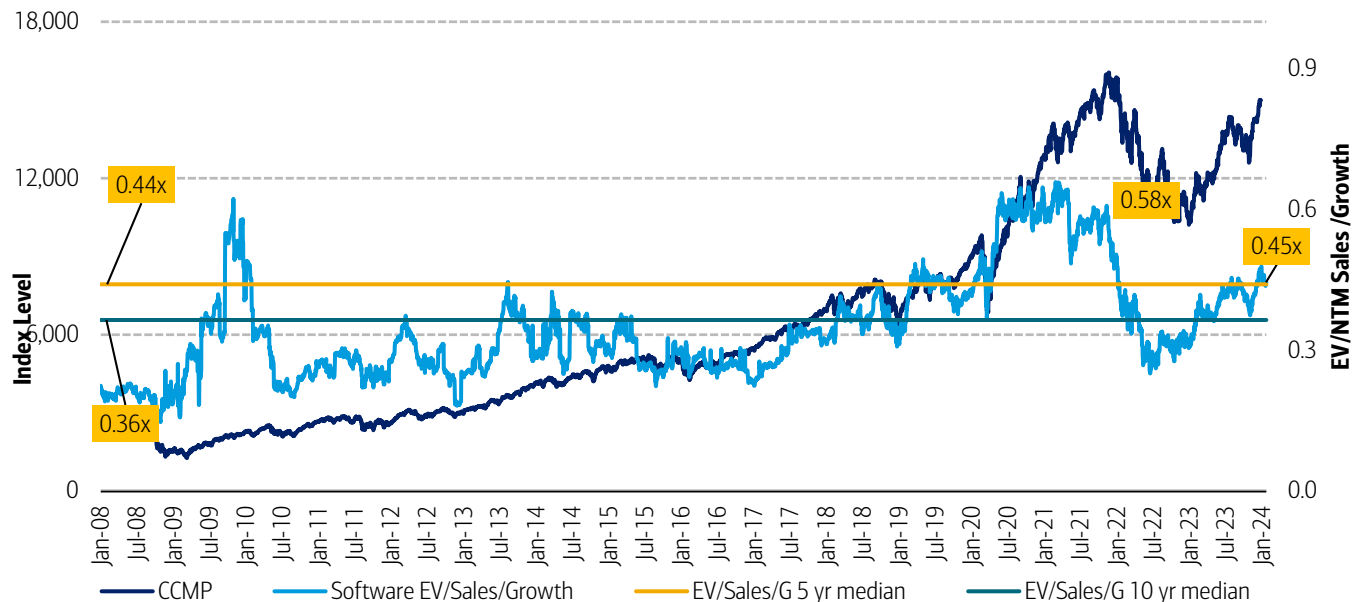


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On an EV/NTM Sales/Growth basis, our software coverage group is trading at 0.45x, -26% from the '21 peak of 0.58x. Our coverage group's current multiple is on par with the 5-year median of 0.44x and +24% from the 10-year median of 0.36x.

Exhibit 3: Software EV/Sales/Growth multiples have expanded above the 10-yr median, but remain depressed relative to the Nasdaq's

EV/NTM Sales/Growth versus Nasdaq (CCMP) - 2008 to date

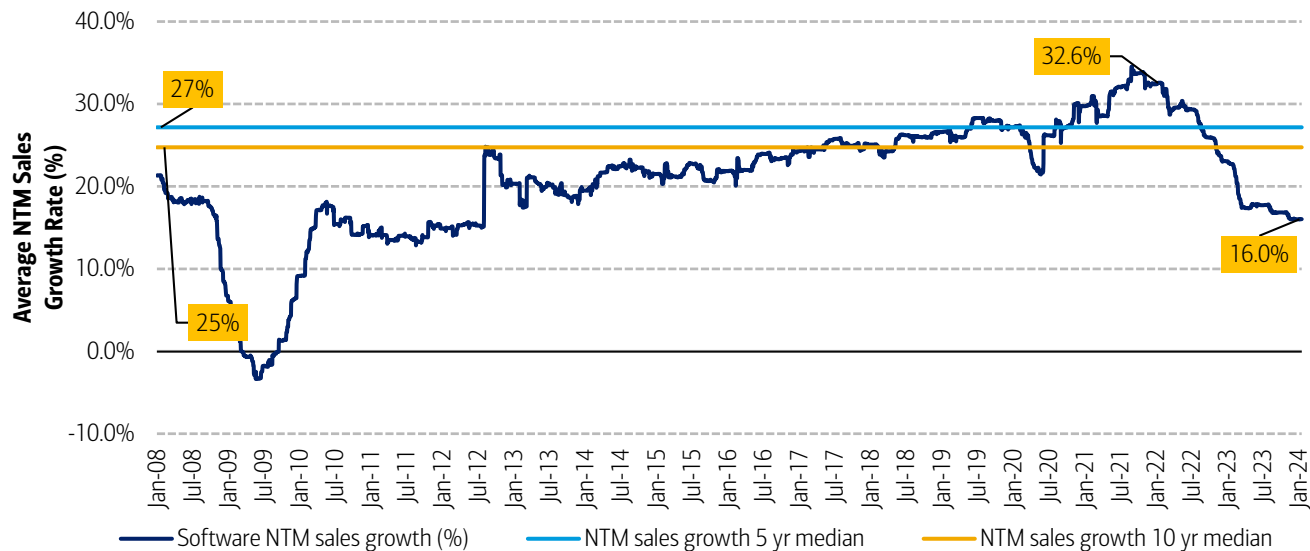


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NTM Sales Growth for our software coverage group is currently 16.0%, -16.6% from the '21 peak of 32.6%. Our software coverage group's current NTM Sales Growth is -11.2% from 5-year median of 27.2% and -8.7% from 10-year median of 24.7%.

Exhibit 4: Growth rates remain muted relative to historical medians on macro-driven budget tightening

NTM Sales Growth – 2008 to date



Source: BofA Global Research estimates, Bloomberg

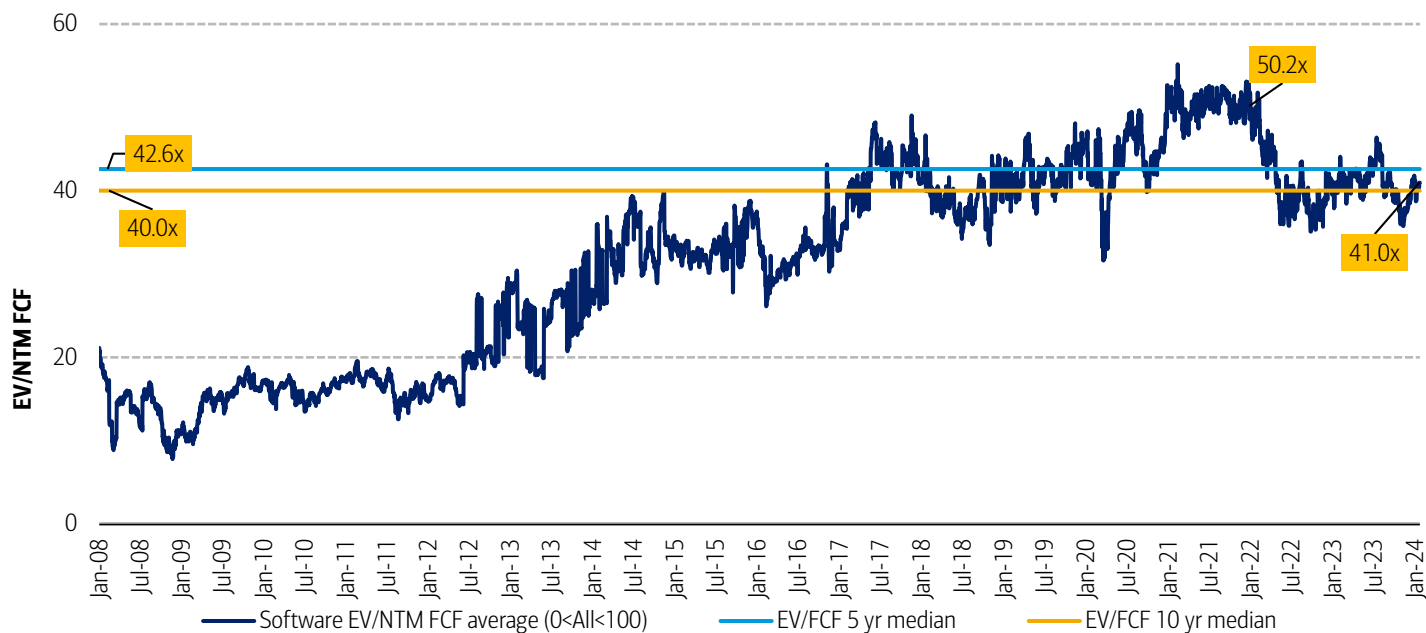
*Constituents: BofA Software coverage

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On an EV/NTM FCF basis, our coverage group is trading at 41.0x, -17% from the '21 peak of 50.2x. Our coverage group's current multiple is -2.4% from the 5-year median of 42.6x and on par with the 10-year median of 40.0x.

Exhibit 5: EV/NTM FCF multiples are on par with the 5-yr and 10-year medians following steady expansion since November 2023

EV/NTM FCF – 2008 to date



Source: BofA Global Research estimates, Bloomberg

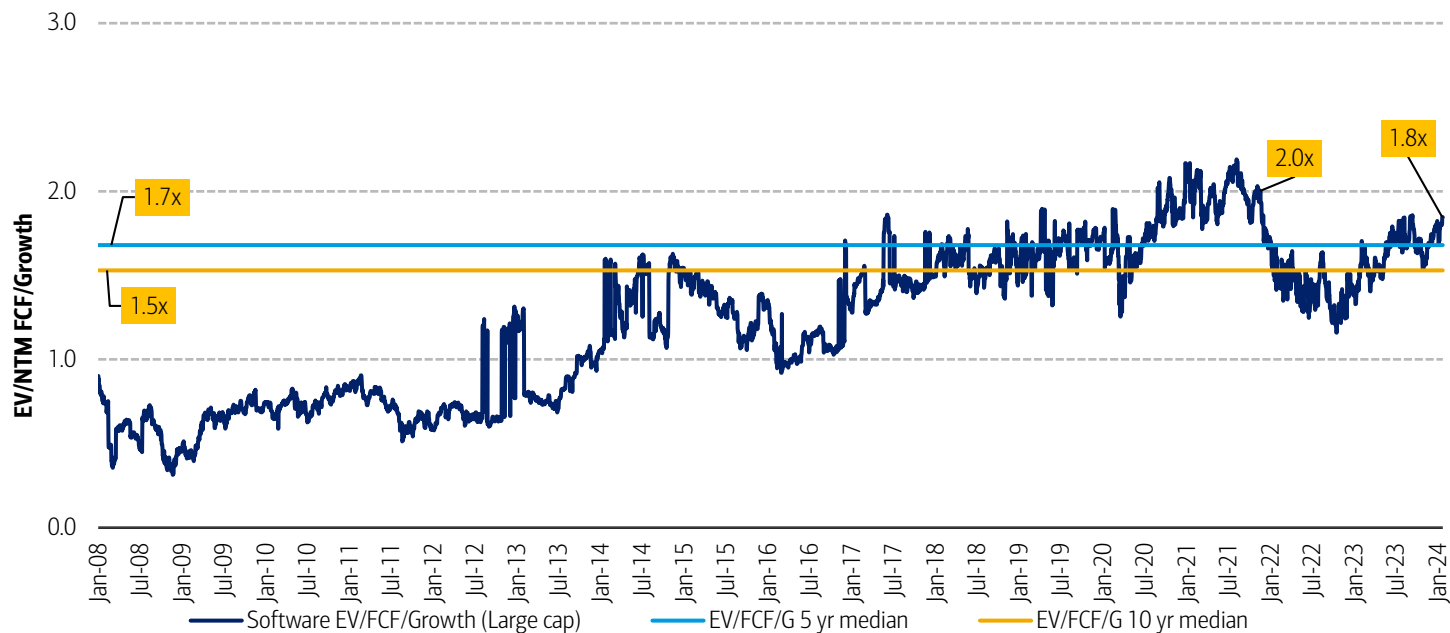
*Constituents: BofA Software coverage

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On an EV/NTM FCF/Growth basis, the large cap software group is trading at 1.8x, -6% from '21 peak at 2.0x. The current multiple is +11% the 5-year median of 1.7x and +22% from the 10-year median of 1.5x.

Exhibit 6: EV/NTM FCF/Growth multiples have expanded since November 2023 and are now above the 5 and 10-year medians

EV/NTM FCF/Growth (large cap) – 2008 to date



Source: BofA Global Research estimates, Bloomberg

*Constituents: BofA Software coverage

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Software Stock Performance Overview

As of Jan 22, our software coverage universe was +2.1% from the prior week (Nasdaq +2.6%) and -0.1% YTD (Nasdaq +2.3%) which compares to +39.8% in 2023 (Nasdaq +43.4%). The Collaboration software group outperformed the broader software group on a YTD basis (+3.9%), led by Dropbox (covered by Mike Funk).

Exhibit 7: Large-cap software outperformed our coverage group in 2023 though lagging Nasdaq and S&P 500 YTD

Software stock performance by size and subcategory

BofA Software Coverage	1 Week	YTD	2023 Return	Buy-rated YTD	Buy-rated 2023 Return
Large-Cap Average	3.0%	3.3%	62.7%	3.6%	81.1%
Mid-Cap Average	2.1%	0.3%	38.0%	2.1%	51.5%
Small-Cap Average	1.6%	-2.5%	26.6%	1.4%	36.6%
Total Group Average	2.1%	-0.1%	39.8%	2.2%	54.0%

Software by Category	1 Week	YTD	2023 Return
Collaboration	2.6%	3.9%	25.5%
Communication	1.3%	-2.0%	-0.6%
CRM	1.3%	-2.5%	39.5%
Design	2.2%	-2.2%	39.1%
ERP & Back office	2.8%	-2.4%	22.2%
HCM	1.4%	-1.0%	1.4%
Infrastructure	3.3%	1.4%	53.7%
Security	2.8%	3.7%	54.0%
Vertical	2.3%	-0.9%	29.8%
Nasdaq	2.6%	2.3%	43.4%
S&P 500	1.4%	1.7%	24.2%

Source: BofA Global Research estimates for companies under coverage, Bloomberg consensus for companies not under coverage. Note that averages are not market-cap weighted. Stocks included in "Software by category" may not be under BofA software coverage.

As of 1/22/2024

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BofA Software Comp Sheet

Exhibit 8: Our large-cap software group is trading at 9.7x CY25e sales and 33.5x CY25e FCF

BofA Software Coverage Comp Sheet – Large Cap

							2023	2024	2025				2023	2024	2025
Mkt Cap				EV/2023	EV/2024	EV/2025	EV/Rev/	EV/Rev/	EV/Rev/	EV/2023	EV/2024	EV/2025	EV/FCF/	EV/FCF/	EV/FCF/
Company	Price	(\$mn)		Sales	Sales	Sales	Growth	Growth	Growth	FCF	FCF	FCF	Growth	Growth	Growth
ADBE	ADOBE INC	\$603.59	277,048	14.1x	12.8x	11.4x	1.4x	1.2x	1.0x	39.4x	29.8x	27.0x	...	0.9x	2.6x
ADSK	AUTODESK INC	\$250.79	54,171	10.0x	9.1x	8.1x	1.1x	0.9x	0.6x	44.1x	34.6x	25.8x	...	1.3x	0.8x
BSY	BENTLEY SYSTEMS INC-CLASS B	\$50.92	16,947	15.0x	13.6x	12.3x	1.2x	1.3x	1.2x	52.4x	52.1x	38.7x	1.4x	...	1.1x
CRM	SALESFORCE INC	\$280.30	274,974	8.0x	7.1x	6.3x	0.7x	0.6x	0.5x	32.1x	25.6x	20.2x	0.9x	1.0x	0.8x
DDOG	DATADOG INC - CLASS A	\$132.98	46,717	21.5x	18.2x	15.2x	0.8x	1.0x	0.8x	80.7x	66.8x	54.9x	1.7x	3.2x	2.5x
DT	DYNATRACE INC	\$58.29	17,358	12.3x	10.5x	8.8x	0.5x	0.6x	0.4x	52.3x	47.7x	36.0x	8.5x	4.9x	1.1x
HUBS	HUBSPOT INC	\$590.25	29,543	13.4x	11.4x	9.4x	0.6x	0.7x	0.4x	84.0x	54.6x	43.5x	3.3x	1.0x	1.7x
INTU	INTUIT INC	\$630.61	178,463	12.1x	10.8x	9.7x	1.2x	0.9x	0.8x	34.3x	36.1x	28.8x	1.1x	...	1.1x
MDB	MONGODB INC	\$413.42	34,107	20.2x	16.5x	13.1x	0.7x	0.7x	0.5x	...	...	...	...	...	...
MSFT	MICROSOFT CORP	\$396.51	2,958,758	12.9x	11.2x	10.0x	1.2x	0.8x	0.8x	41.1x	43.5x	34.5x	2.1x	...	1.3x
NOW	SERVICENOW INC	\$752.45	155,213	17.2x	14.1x	11.5x	0.7x	0.6x	0.5x	57.3x	45.1x	37.0x	2.4x	1.7x	1.7x
ORCL	ORACLE CORP	\$110.10	310,152	7.6x	7.1x	6.5x	0.6x	1.0x	0.8x	38.6x	37.4x	30.9x	1.9x	11.8x	1.5x
SHOP	SHOPIFY INC - CLASS A	\$80.26	91,737	12.6x	10.6x	8.8x	0.5x	0.5x	0.4x	...	56.6x	45.1x	...	0.6x	1.8x
SNOW	SNOWFLAKE INC-CLASS A	\$199.08	72,273	24.8x	19.0x	14.4x	0.7x	0.6x	0.5x	90.6x	65.8x	49.0x	2.0x	1.8x	1.4x
VEEV	VEEVA SYSTEMS INC-CLASS A	\$209.38	34,288	12.9x	11.0x	9.5x	1.4x	0.7x	0.6x	36.1x	30.7x	25.3x	3.7x	1.7x	1.2x
WDAY	WORKDAY INC-CLASS A	\$289.88	77,217	10.1x	8.7x	7.4x	0.6x	0.5x	0.4x	42.7x	35.4x	30.6x	1.3x	1.7x	1.9x
ZM	ZOOM VIDEO COMMUNICATIONS-A	\$69.59	21,600	3.4x	3.3x	3.1x	1.3x	1.1x	0.7x	11.2x	9.9x	9.4x	0.8x	0.7x	1.7x
Average				13.4x	11.5x	9.7x	0.9x	0.8x	0.6x	49.1x	42.0x	33.5x	2.4x	2.5x	1.5x
Median				12.9x	11.0x	9.5x	0.7x	0.7x	0.6x	42.7x	40.5x	32.7x	1.9x	1.7x	1.4x

Source: BofA Global Research estimates
As of 1/22/2024

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Exhibit 9: Our mid-cap software group is trading at 5.6x C25e Sales, or 0.4x on a growth adjusted basis

BofA Software Coverage Comp Sheet – Mid Cap

							2023	2024	2025				2023	2024	2025
		Mkt Cap		EV/2023	EV/2024	EV/2025	EV/Rev/	EV/Rev/	EV/Rev/	EV/2023	EV/2024	EV/2025	EV/FCF/	EV/FCF/	EV/FCF/
Company	Price	(\$mn)		Sales	Sales	Sales	Growth	Growth	Growth	FCF	FCF	FCF	Growth	Growth	Growth
BILL	BILL HOLDINGS INC	\$75.12	8,024	6.2x	5.6x	4.6x	0.2x	0.5x	0.2x	61.1x	40.9x	32.5x	0.8x	0.8x	1.3x
CFLT	CONFLUENT INC-CLASS A	\$22.40	7,300	8.5x	7.0x	5.6x	0.3x	0.3x	0.2x	...	...	...	...	...	...
DBX	DROPBOX INC-CLASS A	\$32.72	11,321	4.9x	4.8x	4.6x	0.7x	1.5x	1.2x	15.7x	12.7x	11.7x	6.8x	0.5x	1.3x
DOCU	DOCUSIGN INC	\$62.01	12,901	4.4x	4.2x	3.9x	0.5x	0.7x	0.5x	16.8x	15.8x	14.5x	0.2x	2.5x	1.6x
ESTC	ELASTIC NV	\$123.22	12,629	9.7x	8.4x	7.2x	0.6x	0.5x	0.4x	...	65.1x	49.3x	...	0.7x	1.5x
FIVN	FIVE9 INC	\$79.79	5,639	6.3x	5.4x	4.6x	0.4x	0.3x	0.3x	67.7x	43.5x	28.6x	0.4x	0.8x	0.5x
FRSH	FRESHWORKS INC-CL A	\$21.97	7,096	10.0x	8.5x	7.2x	0.5x	0.5x	0.4x	83.3x	50.1x	36.6x	...	0.8x	1.0x
GLBE	GLOBAL-E ONLINE LTD	\$38.00	6,801	11.6x	8.7x	6.5x	0.3x	0.3x	0.2x	62.3x	48.4x	32.3x	1.5x	1.7x	0.6x
GTLB	GITLAB INC-CL A	\$70.29	11,591	18.5x	14.9x	11.6x	0.5x	0.6x	0.4x	...	...	...	...	...	...
GWRE	GUIDEWIRE SOFTWARE INC	\$115.48	9,434	9.9x	8.9x	7.8x	1.5x	0.8x	0.6x	...	56.4x	43.2x	...	0.5x	1.4x
INFA	INFORMATICA	\$30.90	9,164	6.4x	6.3x	5.8x	1.3x	2.1x	0.8x	41.6x	33.3x	28.4x	1.9x	1.3x	1.6x
NICE	NICE LTD - SPON ADR	\$213.58	14,278	5.6x	5.1x	4.6x	0.6x	0.5x	0.4x	26.9x	21.8x	19.1x	2.5x	0.9x	1.4x
PATH	UIPATH INC - CLASS A	\$23.49	13,320	9.0x	7.3x	5.9x	0.4x	0.3x	0.3x	45.1x	40.3x	29.4x	...	3.4x	0.8x
PAYC	PAYCOM SOFTWARE INC	\$195.21	11,316	6.5x	5.8x	5.1x	0.3x	0.5x	0.4x	37.1x	31.0x	25.8x	1.4x	1.6x	1.3x
PCTY	PAYLOCITY HOLDING CORP	\$153.06	8,706	6.6x	5.6x	4.8x	0.2x	0.3x	0.3x	32.1x	27.7x	23.1x	0.5x	1.7x	1.2x
TWLO	TWILIO INC - A	\$73.92	13,838	2.6x	2.4x	2.2x	0.3x	0.4x	0.2x	74.8x	25.5x	18.2x	...	0.1x	0.5x
U	UNITY SOFTWARE INC	\$34.22	11,220	5.9x	5.2x	4.2x	0.1x	0.4x	0.2x	42.3x	19.9x	12.3x	...	0.2x	0.2x
ZI	ZOOMINFO TECHNOLOGIES INC	\$15.77	6,475	5.9x	5.8x	5.5x	0.5x	3.7x	0.9x	18.5x	18.2x	17.0x	12.6x	12.0x	2.4x
Average				7.7x	6.7x	5.6x	0.5x	0.8x	0.4x	44.7x	34.4x	26.4x	2.9x	1.8x	1.2x
Median				6.5x	5.8x	5.3x	0.4x	0.5x	0.4x	42.0x	32.1x	27.1x	1.5x	0.9x	1.3x

Source: BofA Global Research estimates
As of 1/22/2024

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Exhibit 10: Our small-cap coverage group is trading at 4.1x C25e Sales, or 0.4x on a growth adjusted basis

BofA Software Coverage Comp Sheet – Small Cap

		Mkt Cap		EV/2023	EV/2024	EV/2025	2023	2024	2025	EV/2023	EV/2024	EV/2025	2023	2024	2025
Company		Price	(\$mn)	Sales	Sales	Sales	EV/Rev/ Growth	EV/Rev/ Growth	EV/Rev/ Growth	FCF	FCF	FCF	EV/FCF/ Growth	EV/FCF/ Growth	EV/FCF/ Growth
AI	C3.AI INC-A	\$26.44	3,137	8.2x	7.1x	6.2x	0.8x	0.4x	0.4x	...	...	49.0x	...	...	...
ALRM	ALARM.COM HOLDINGS INC	\$62.53	3,425	3.7x	3.6x	3.3x	0.8x	0.8x	0.4x	29.6x	59.4x	22.7x	0.1x	...	0.1x
AMPL	AMPLITUDE INC-CLASS A	\$12.82	1,871	5.6x	5.3x	4.8x	0.3x	0.7x	0.5x	70.2x	62.1x	50.4x	...	4.8x	2.2x
AVDX	AVIDXCHANGE	\$11.02	2,204	5.1x	4.5x	3.8x	0.3x	0.3x	0.2x	...	...	39.1x	...	...	0.2x
AYX	ALTERYX INC - CLASS A	\$47.44	3,383	4.2x	3.8x	3.4x	0.4x	0.3x	0.3x	...	75.7x	37.5x	...	0.6x	0.4x
BIGC	BIGCOMMERCE HOLDINGS	\$8.44	642	2.4x	2.2x	2.0x	0.2x	0.2x	0.2x	...	50.0x	31.6x	...	...	0.5x
BL	BLACKLINE INC	\$60.80	4,533	7.7x	6.9x	6.3x	0.6x	0.6x	0.6x	41.8x	35.6x	29.0x	0.3x	2.1x	1.3x
BLKB	BLACKBAUD INC	\$82.56	4,390	4.6x	4.4x	4.1x	0.9x	0.7x	0.7x	24.5x	21.7x	19.0x	0.4x	1.6x	1.4x
EGHT	8X8 INC	\$3.55	429	1.1x	1.1x	1.0x	...	0.8x	0.2x	7.7x	6.5x	5.4x	0.0x	0.3x	0.3x
ENFV	ENFUSION	\$9.00	1,151	6.6x	5.7x	4.9x	0.4x	0.3x	0.3x	59.2x	54.6x	36.8x	0.3x	6.5x	0.8x
EVBG	EVERBRIDGE INC	\$22.61	995	2.9x	2.7x	2.6x	0.8x	0.5x	0.4x	47.3x	30.1x	21.2x	0.0x	0.5x	0.5x
FROG	JFROG LTD	\$34.24	3,773	9.5x	7.7x	6.2x	0.4x	0.3x	0.3x	62.6x	46.4x	32.4x	0.3x	1.3x	0.7x
HCP	HASHICORP INC-CL A	\$21.66	4,215	5.2x	4.5x	3.8x	0.2x	0.3x	0.2x	...	35.8x	23.4x	...	...	0.4x
INTA	INTAPP INC	\$43.54	3,464	8.5x	7.3x	6.3x	0.3x	0.4x	0.4x	93.2x	61.5x	44.1x	1.0x	1.2x	1.1x
JAMF	JAMF HOLDING CORP	\$19.91	2,707	5.1x	4.5x	4.0x	0.3x	0.3x	0.3x	66.1x	47.6x	36.9x	...	1.2x	1.3x
LAW	CS DISCO INC	\$8.32	540	2.8x	2.6x	2.3x	1.7x	0.3x	0.2x	...	...	...	...	...	...
LSPD	LIGHTSPEED COMMERCE INC	\$18.61	2,856	2.5x	2.0x	1.7x	0.1x	0.1x	0.1x	...	39.6x	47.4x	...	...	...
MLNK	MERIDIANLINK INC	\$23.42	1,899	7.3x	6.9x	6.5x	1.3x	1.2x	0.9x	31.7x	24.6x	21.6x	...	0.8x	1.6x
NCNO	NCINO INC	\$32.70	3,694	7.7x	6.7x	5.8x	0.5x	0.5x	0.4x	50.2x	45.0x	45.2x	...	3.9x	...
PD	PAGERDUTY INC	\$25.91	2,493	5.5x	5.0x	4.4x	0.3x	0.5x	0.3x	33.8x	25.3x	20.3x	0.1x	0.8x	0.8x
PWSC	POWERSCHOOL HOLDINGS	\$24.34	4,949	7.9x	6.9x	6.3x	0.7x	0.5x	0.7x	31.4x	26.1x	22.6x	1.6x	1.3x	1.4x
RNG	RINGCENTRAL INC-CLASS A	\$35.34	3,343	2.2x	2.0x	1.8x	0.2x	0.2x	0.2x	16.1x	12.3x	8.4x	0.1x	0.4x	0.2x
VERX	VERTEX INC - CLASS A	\$25.40	3,863	6.9x	6.1x	5.5x	0.5x	0.5x	0.4x	87.6x	57.0x	40.3x	0.6x	1.1x	1.0x
WEAV	WEAVE COMMUNICATIONS INC	\$11.46	740	4.1x	3.6x	3.1x	0.2x	0.3x	0.2x	...	37.4x	21.8x	...	0.2x	0.3x
ZETA	ZETA GLOBAL HOLDINGS	\$9.80	2,121	3.0x	2.6x	2.3x	0.1x	0.2x	0.2x	26.6x	18.5x	15.1x	0.6x	0.4x	0.7x
Average				5.2x	4.6x	4.1x	0.5x	0.5x	0.4x	45.9x	39.7x	30.1x	0.4x	1.6x	0.8x
Median				5.1x	4.5x	4.0x	0.4x	0.4x	0.3x	41.8x	38.5x	30.3x	0.3x	1.1x	0.7x

Source: BofA Global Research estimates
As of 1/22/2024

Software Valuation by Category

We categorized the enterprise software space across 9 categories: Collaboration, Communication, CRM, Design, ERP & Back Office, HCM, Infrastructure, Security and Vertical software.

Exhibit 11: Design software is currently trading at a significant premium to the broader software group (9.9x C25 Sales, or 0.9x growth adjusted)

Software comp sheet by category

Categories	Mkt Cap (\$mn)	EV/2023 Sales	EV/2024 Sales	EV/2025 Sales	2023 EV/Rev/ Growth	2024 EV/Rev/ Growth	2025 EV/Rev/ Growth	EV/2023 FCF	EV/2024 FCF	EV/2025 FCF	2023 EV/FCF/ Growth	2024 EV/FCF/ Growth	2025 EV/FCF/ Growth
Collaboration	\$34,634												
Average		6.4x	5.5x	4.8x	0.4x	0.7x	0.5x	30.3x	25.1x	27.4x	2.1x	10.6x	0.8x
Median		6.1x	5.1x	4.6x	0.3x	0.5x	0.4x	29.8x	23.4x	21.9x	0.8x	1.6x	0.8x
Communication	\$62,295												
Average		2.9x	2.6x	2.7x	-0.4x	0.5x	0.3x	31.7x	21.2x	15.2x	0.9x	0.5x	0.7x
Median		2.3x	2.2x	2.2x	0.2x	0.4x	0.3x	17.1x	17.3x	14.5x	0.6x	0.4x	0.5x
CRM	\$471,985												
Average		6.3x	5.4x	4.5x	0.4x	-2.1x	0.3x	46.2x	41.5x	32.4x	2.4x	5.7x	1.3x
Median		5.1x	4.3x	3.8x	0.3x	0.4x	0.3x	40.9x	39.6x	31.9x	0.9x	0.7x	0.7x
Design	\$576,719												
Average		12.3x	11.1x	9.9x	1.2x	1.1x	0.9x	45.5x	36.9x	30.6x	1.6x	10.6x	0.0x
Median		11.9x	10.8x	9.6x	1.3x	1.1x	1.0x	43.4x	35.1x	32.4x	1.4x	1.7x	1.5x
ERP & Back Office	\$520,640												
Average		6.8x	6.1x	5.4x	2.5x	0.5x	1.8x	46.0x	38.6x	31.1x	0.9x	1.0x	-6.9x
Median		6.2x	5.7x	5.1x	0.5x	0.5x	0.4x	42.7x	36.1x	32.5x	0.8x	1.1x	1.0x
HCM	\$254,858												
Average		7.2x	6.4x	5.7x	0.5x	0.6x	0.6x	32.7x	40.4x	32.5x	1.3x	4.2x	1.7x
Median		6.6x	5.8x	5.1x	0.3x	0.5x	0.4x	32.1x	31.0x	25.8x	1.3x	1.7x	1.3x
Infrastructure	\$3,810,856												
Average		9.2x	7.8x	6.6x	0.6x	0.6x	0.4x	52.8x	43.3x	33.0x	1.0x	1.6x	1.1x
Median		7.0x	6.6x	5.7x	0.5x	0.6x	0.4x	52.3x	44.3x	35.2x	1.7x	1.3x	1.1x
Security	\$249,840												
Average		9.2x	7.8x	6.7x	0.3x	0.7x	0.6x	38.6x	34.3x	29.8x	0.7x	3.0x	1.2x
Median		6.9x	6.5x	6.2x	0.4x	0.6x	0.4x	31.5x	27.5x	23.3x	1.0x	1.8x	1.1x
Vertical	\$183,180												
Average		7.4x	6.4x	5.7x	0.5x	0.5x	0.5x	41.3x	38.5x	30.1x	0.6x	1.7x	1.2x
Median		7.3x	6.8x	6.1x	0.4x	0.5x	0.4x	34.4x	30.3x	25.8x	0.7x	1.0x	1.2x

Source: BofA Global Research estimates for companies under coverage, Bloomberg consensus for companies not under coverage
As of 1/22/24. Stocks included may not be under BofA software coverage. See appendix.

On an EV/NTM Sales basis, the Infrastructure software group saw the largest multiple expansion w/w (+4.5%) led by GitLab (covered by Koji Ikeda), with the Design software group seeing the largest expansion relative to the 5-year median (+8.2%), led by PTC Inc (covered by Andrew B Obin).

On an EV/NTM FCF basis, the Infrastructure software group saw the largest multiple expansion w/w (+4.3%) led by Elastic (covered by Koji Ikeda), with Security software seeing the largest multiple expansion relative to the 5-year median (+11.3%) led by Palo Alto Networks (covered by Tal Liani).

Exhibit 12: Infrastructure software saw the largest EV/NTM Sales multiple expansion, led by GitLab

Software multiple expansion/contraction by category

Category	EV/NTM Sales				EV/NTM Sales/growth				EV/NTM FCF			
	Multiple		% Change		Multiple		% Change		Multiple		% Change	
	Current	5-yr median	1 wk	5-yr median	Current	5-yr median	1 wk	5-yr median	Current	5-yr median	1 wk	5-yr median
Collaboration	5.8x	7.3x	2.9%	-19.5%	0.6x	0.4x	3.0%	65.9%	29.7x	17.8x	2.2%	NA
Communication	2.5x	7.7x	1.7%	-68.2%	1.0x	0.4x	-42.0%	128.7%	26.2x	32.9x	-1.5%	-20.5%
CRM	5.1x	8.6x	0.6%	-40.4%	0.4x	0.3x	0.5%	17.8%	39.4x	46.0x	0.2%	-14.5%
Design	10.5x	9.7x	3.0%	8.2%	1.1x	0.8x	3.3%	37.5%	38.6x	35.0x	2.7%	10.4%
ERP & Back Office	5.3x	7.7x	2.8%	-31.0%	0.4x	0.5x	-8.2%	-12.7%	39.1x	42.6x	3.6%	-8.2%
HCM	6.5x	9.8x	1.6%	-34.0%	0.5x	0.6x	1.8%	-8.5%	43.4x	48.2x	2.0%	-9.9%
Infrastructure	7.8x	10.6x	4.5%	-26.6%	0.5x	0.6x	3.2%	-14.4%	42.9x	42.5x	4.3%	0.9%
Security	8.2x	9.0x	3.3%	-8.7%	0.7x	0.6x	2.3%	28.9%	33.7x	30.2x	2.2%	11.3%
Vertical	6.3x	7.9x	1.5%	-20.3%	0.7x	0.6x	0.6%	7.0%	37.6x	42.0x	0.6%	-10.5%

Source: BofA Global Research estimates for companies under coverage, Bloomberg consensus for companies not under coverage
As of 1/22/24. Stocks included may not be under BofA software coverage. See appendix.

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Appendix

Exhibit 13: Our software by category analysis includes the stocks below

Software companies by category

Collaboration		Communication		CRM		Design		ERP and back office		HCM		Infrastructure		Security		Vertical	
ASAN	Asana Inc	EGAN	eGain	BIGC	Bigcommerce	ADBE	Adobe	AVDX	AvidXchange	ADP	Automatic Data	AI	C3.ai	ALRM	Alarm	APPF	Appfolio
BOX	Box Inc	EGHT	8x8	CRM	Salesforce.com	ADSK	Autodesk	BILL	BILL	CDAY	Ceridian HCM	AMPL	Amplitude	CHKP	Check Point	BLKB	Blackbaud
DBX	Dropbox	FIVN	Five9	CRTO	Criteo	ANSS	Ansys, Inc.	BL	BlackLine, Inc.	PAYC	Paycom	APPN	Appian	CLVT	Clarivate PLC	CCCS	CCC Intelligent Sol
MNDY	Monday.com	KLTR	Kaltura	CVO	Coveo	AZPN	AspenTech	DOCU	DocuSign	PAYX	Paychex	AYX	Alteryx, Inc	CRWD	CrowdStrike	COUR	Coudera
SMAR	Smartsheet	LPSN	LivePerson	CXM	Sprinklr	BSY	Bentley Systems	EXFY	Expensify	PCTY	Paylocity	BASE	Couchbase	CYBR	CyberArk	CPLF	Copperleaf
		LVOX	LiveVox	FRSH	Freshworks	CDNS	Cadence	INTU	Intuit	PYCR	Paycor HCM Inc	BBAI	Bigbear.AI	FTNT	Fortinet	CWAN	Clearware Analytics
		MCHX	Marchex	GLBE	Global-e Online	DSY	Dessault	LAW	Disco	WDAY	Workday	CFLT	Confluent	GEN	Gen Digital	DH	Definitive Hlthcare.
		NICE	NICE Ltd.	HUBS	HubSpot	NEM	Newmont	MANH	Manhattan Associates			DDOG	Datadog	OKTA	Okta Inc	DOX	Amdocs
		RNG	RingCentral	LSPD	Lightspeed	PTC	PTC	QTWO	Q2			DOMO	Domo	PANW	Palo Alto Networks	EBIX	Ebix
		TWLO	Twilio	ONTF	ON24	U	Unity	SAP	SAP			DT	Dynatrace	QLYS	Qualys	ENFN	Enfusion, Inc.
		VRNT	Verint	SEMR	SEMrush			UPLD	Upland Software			ESTC	Elastic	RPD	Rapid7	ETWO	E2open
		ZM	Zoom	SHOP	Shopify, Inc.			VERX	Vertex			EVBG	Everbridge	S	SentinelOne	EVCN	EverCommerce
				SPT	Sprout Social			WK	Workiva Inc			FROG	IFrog	SCWX	SecureWorks	GWRE	Guidewire
				WIX	Wix			ZUO	Zuora			GTLB	GitLab	TENB	Tenable	INST	Instructure
				YEXT	Yext							HCP	HashiCorp	ZS	Zscaler	INTA	Intapp
				ZETA	Zeta Global							INFA	Informatica			IOT	Samsara Inc
				ZI	ZoomInfo							JAMF	Jamf			KARO	Karooooo
												MDB	MongoDB			MLNK	MeridianLink
												MSFT	Microsoft			MODN	Model N
												NOW	ServiceNow			NCNO	nCino
												ORCL	Oracle			PAR	Par Technology
												OTEX	Open Text			PCOR	Procore
												PATH	UiPath			PRO	PROS
												PD	PagerDuty			PWSC	PowerSchool
												PEGA	Pegasystems			SPSC	SPS Commerce
												PLTR	Palantir			TEMN	Temenos
												SNOW	Snowflake			TOST	Toast
												SWI	Solarwinds			TYL	Tyler Technologies
												TEAM	Atlassian			VEEV	Veeva Systems
																WEAV	Weave

Source: BofA Global Research

Stocks included may not be under BofA software coverage

BofA GLOBAL RESEARCH

Exhibit 14: YTD large-cap software stock performance outperformed Nasdaq and S&P 500

Large-cap software stock performance

	1 Week	YTD	2023 Return
Nasdaq	2.6%	2.3%	43.4%
S&P 500	1.4%	1.7%	24.2%
ADBE	1.2%	1.2%	77.3%
ADSK	3.5%	3.0%	30.3%
BSY	4.7%	-2.4%	41.2%
CRM	3.1%	6.5%	98.5%
DDOG	8.2%	9.6%	65.1%
HUBS	5.0%	1.6%	100.8%
INTU	3.0%	0.8%	60.6%
MDB	5.7%	1.3%	107.7%
MSFT	2.1%	5.5%	56.8%
NOW	3.3%	6.6%	82.0%
ORCL	3.3%	4.5%	29.0%
SHOP	-1.3%	3.1%	124.4%
SNOW	4.2%	0.1%	38.6%
VEEV	0.5%	9.0%	19.3%
WDAY	2.4%	5.0%	65.0%
ZM	-1.2%	-3.2%	6.2%
Large-Cap Average	3.0%	3.3%	62.7%

Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 15: YTD mid-cap software stock performance lagged Nasdaq and S&P 500

Mid-cap software stock performance

	1 Week	YTD	2023 Return
Nasdaq	2.6%	2.3%	43.4%
S&P 500	1.4%	1.7%	24.2%
BILL	0.0%	-8.1%	-25.1%
CFLT	0.6%	-4.1%	5.2%
DBX	3.6%	11.0%	31.7%
DOCU	-2.2%	4.5%	7.3%
DT	3.6%	6.6%	42.8%
ESTC	10.3%	9.6%	118.8%
FRSH	-6.9%	-6.5%	59.7%
GLBE	-3.8%	-4.2%	92.0%
GTLB	14.2%	11.7%	38.6%
GWRE	2.6%	6.1%	74.3%
INFA	6.3%	8.8%	74.3%
NICE	2.7%	7.1%	3.7%
PATH	5.8%	-5.5%	95.4%
PAYC	-0.9%	-5.3%	-33.4%
PCTY	-1.0%	-7.2%	-15.1%
TWLO	1.0%	-2.6%	55.0%
U	-1.0%	-16.2%	43.0%
Mid-Cap Average	2.1%	0.3%	39.3%

Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 16: YTD small-cap software stock performance lagged Nasdaq and S&P 500

Small-cap software stock performance

	1 Week	YTD	2023 Return
Nasdaq	2.6%	2.3%	43.4%
S&P 500	1.4%	1.7%	24.2%
AI	0.9%	-7.9%	156.6%
ALRM	-0.3%	-3.2%	30.6%
AMPL	1.1%	0.7%	5.3%
AVDX	-2.7%	-11.2%	24.6%
AYX	0.0%	0.5%	-6.9%
BIGC	0.4%	-13.3%	11.3%
BL	5.6%	-2.6%	-7.2%
BLKB	0.3%	-4.8%	47.3%
CVO	2.3%	-8.5%	5.7%
EGHT	1.3%	-6.0%	-12.5%
ENFN	2.5%	-7.2%	0.3%
EVBG	2.6%	-7.0%	-17.8%
FIVN	2.8%	1.4%	16.0%
FROG	3.9%	-1.0%	62.3%
HCP	-3.6%	-8.4%	-13.5%
INTA	5.2%	14.5%	52.4%
JAMF	4.7%	10.3%	-15.2%
LAW	4.6%	9.0%	20.1%
LSPD	-2.0%	-11.4%	46.8%
MLNK	0.7%	-5.5%	80.4%
NCNO	-7.0%	-3.0%	27.2%
PWSC	0.1%	3.3%	2.1%
RNG	7.1%	4.3%	-4.1%
VERX	7.8%	-5.8%	85.7%
WEAV	3.7%	-0.3%	150.4%
ZETA	1.8%	11.3%	8.0%
ZI	0.4%	-14.7%	-38.6%
Small-Cap Average	1.6%	-2.5%	26.6%

Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 17: Zeta within CRM software led the stock performance YTD

Collaboration, Communications, CRM, and Design software stock performance

	1 Week	YTD	2023 Return
Nasdaq	2.6%	2.3%	43.4%
S&P 500	1.4%	1.7%	24.2%
ASAN	2.3%	0.0%	38.1%
BOX	5.2%	4.0%	-17.7%
DBX	3.6%	11.0%	31.7%
MNDY	6.2%	7.8%	53.9%
SMAR	-4.4%	-3.5%	21.5%
Collaboration Average	2.6%	3.9%	25.5%
EGAN	0.8%	-7.0%	-7.8%
EGHT	1.3%	-6.0%	-12.5%
FIVN	2.8%	1.4%	16.0%
KLTR	8.4%	-1.0%	13.4%
LPSN	-12.2%	-20.3%	-62.6%
LVOX	0.0%	0.0%	25.6%
MCHX	-2.3%	-4.4%	-15.0%
NICE	2.7%	7.1%	3.7%
RNG	7.1%	4.3%	-4.1%
TWLO	1.0%	-2.6%	55.0%
VRNT	7.6%	8.0%	-25.5%
ZM	-1.2%	-3.2%	6.2%
Communication Average	1.3%	-2.0%	-0.6%
BIGC	0.4%	-13.3%	11.3%
CRM	3.1%	6.5%	98.5%
CRTO	2.2%	-2.2%	-2.8%
CVO	2.3%	-8.5%	5.7%
CXM	-0.1%	2.4%	47.4%
FRSH	-6.9%	-6.5%	59.7%
GLBE	-3.8%	-4.2%	92.0%
HUBS	5.0%	1.6%	100.8%
LSPD	-2.0%	-11.4%	46.8%
ONTF	3.4%	-6.2%	-8.7%
SEMR	-2.2%	-11.6%	67.8%
SHOP	-1.3%	3.1%	124.4%
SPT	6.4%	3.5%	8.8%
WIX	2.9%	4.8%	60.1%
YEXT	10.7%	3.0%	-9.8%
ZETA	1.8%	11.3%	8.0%
ZI	0.4%	-14.7%	-38.6%
CRM Average	1.3%	-2.5%	39.5%
ADBE	1.2%	1.2%	77.3%
ADSK	3.5%	3.0%	30.3%
ANSS	-1.5%	-6.0%	50.2%
AZPN	2.8%	-6.4%	7.2%
BSY	4.7%	-2.4%	41.2%
CDNS	10.1%	8.5%	69.6%
DSY	5.8%	6.6%	32.1%
NEM	-7.0%	-15.4%	-12.3%
PTC	2.8%	1.2%	45.8%
PTC	2.8%	1.2%	45.8%
U	-1.0%	-16.2%	43.0%
Design Average	2.2%	-2.2%	39.1%

Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 18: Jamf within Infrastructure led the stock outperformance YTD

ERP & Back Office, HCM, and Infrastructure software stock performance

	1 Week	YTD	2023 Return
Nasdaq	2.6%	2.3%	43.4%
S&P 500	1.4%	1.7%	24.2%
AVDX	-2.7%	-11.2%	24.6%
BILL	0.0%	-8.1%	-25.1%
BL	5.6%	-2.6%	-7.2%
DOCU	-2.2%	4.5%	7.3%
EXFY	0.0%	-20.2%	-72.0%
INTU	3.0%	0.8%	60.6%
LAW	4.6%	9.0%	20.1%
MANH	6.5%	4.2%	77.4%
QTSO	5.9%	3.3%	61.6%
SAP	2.8%	5.5%	49.8%
UPLD	1.9%	-2.5%	-40.7%
VERX	7.8%	-5.8%	85.7%
WK	1.7%	-4.8%	20.9%
ZUO	4.5%	-6.1%	47.8%
ERP & Back Office Average	2.8%	-2.4%	22.2%
ADP	1.5%	2.8%	-2.5%
CDAY	3.7%	0.9%	4.6%
PAYC	-0.9%	-5.3%	-33.4%
PAYX	2.6%	3.1%	3.1%
PCTY	-1.0%	-7.2%	-15.1%
PYCR	1.8%	-6.2%	-11.8%
WDAY	2.4%	5.0%	65.0%
HCM Average	1.4%	-1.0%	1.4%
AI	0.9%	-7.9%	156.6%
AMPL	1.1%	0.7%	5.3%
APPN	0.1%	-10.4%	15.7%
AYX	0.0%	0.5%	-6.9%
BASE	6.0%	10.0%	69.8%
BBAI	-3.0%	-9.3%	217.6%
CFLT	0.6%	-4.1%	5.2%
DDOG	8.2%	9.6%	65.1%
DOMO	5.3%	-4.0%	-27.7%
DT	3.6%	6.6%	42.8%
ESTC	10.3%	9.6%	118.8%
EVBG	2.6%	-7.0%	-17.8%
FROG	3.9%	-1.0%	62.3%
GTLB	14.2%	11.7%	38.6%
HCP	-3.6%	-8.4%	-13.5%
INFA	6.3%	8.8%	74.3%
JAMF	4.7%	10.3%	-15.2%
MDB	5.7%	1.3%	107.7%
MSFT	2.1%	5.5%	56.8%
NOW	3.3%	6.6%	82.0%
ORCL	3.3%	4.5%	29.0%
OTEX	0.4%	-0.8%	41.8%
PATH	5.8%	-5.5%	95.4%
PD	-1.4%	11.7%	-12.8%
PEGA	0.6%	-1.9%	42.7%
PLTR	5.1%	2.6%	167.4%
SNOW	4.2%	0.1%	38.6%
SWI	2.9%	-2.4%	33.4%
TEAM	3.6%	3.2%	84.8%
Infrastructure Average	1.3%	1.4%	53.7%

Source: BofA Global Research, Bloomberg

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Exhibit 19: Palo Alto Networks within Security led the stock performance YTD

Security and Vertical software stock performance

	1 Week	YTD	2023 Return
Nasdaq	2.6%	2.3%	43.4%
S&P 500	1.4%	1.7%	24.2%
ALRM	-0.3%	-3.2%	30.6%
CHKP	0.3%	4.2%	21.1%
CLVT	1.2%	-0.8%	11.0%
CRWD	5.3%	16.9%	142.5%
CYBR	4.5%	6.9%	69.0%
FTNT	0.3%	7.0%	19.7%
GEN	2.0%	3.2%	6.5%
OKTA	0.9%	-6.6%	32.5%
PANW	6.4%	17.3%	111.3%
QLYS	2.5%	0.9%	74.9%
RPD	-0.3%	-3.9%	68.0%
S	4.0%	-4.0%	88.1%
SCWX	9.1%	5.8%	15.5%
TENB	1.2%	3.4%	20.7%
ZS	4.3%	8.7%	98.0%
Security Average	2.8%	3.7%	54.0%
APPF	0.6%	5.1%	64.4%
BLKB	0.3%	-4.8%	47.3%
CCCS	0.9%	-3.2%	30.9%
COUR	-8.3%	-7.2%	63.7%
CPLF	3.9%	4.1%	5.2%
CWAN	-5.5%	-5.2%	6.8%
DH	-1.2%	-6.5%	-9.6%
DOX	2.2%	6.2%	-3.3%
ENFN	2.5%	-7.2%	0.3%
ETWO	7.0%	-11.5%	-25.2%
EVM	2.7%	-6.7%	48.3%
GWRE	2.6%	6.1%	74.3%
INST	0.2%	-4.7%	15.2%
INTA	5.2%	14.5%	52.4%
IOT	0.4%	-0.2%	168.5%
KARO	5.0%	3.1%	4.3%
MLNK	0.7%	-5.5%	80.4%
MODN	4.0%	4.4%	-33.6%
NCNO	-7.0%	-3.0%	27.2%
PAR	14.8%	5.8%	67.0%
PCOR	2.9%	2.9%	46.7%
PRO	5.0%	-4.8%	59.9%
PWSC	0.1%	3.3%	2.1%
SPSC	4.2%	-2.7%	50.9%
TEMN	8.9%	10.3%	54.2%
TOST	-4.0%	-5.7%	1.3%
TWOU	-9.6%	-28.5%	-80.4%
TYL	2.6%	5.3%	29.7%
VEEV	0.5%	9.0%	19.3%
WEAV	3.7%	-0.3%	150.4%
Vertical Average	1.5%	-0.9%	34.0%

Source: BofA Global Research, Bloomberg

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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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