

# ***BlueStar IoT Index***

## **Index Methodology Guide 1.2**

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### **Produced by:**

BlueStar Global Investors, LLC d/b/a BlueStar Indexes  
1350 Avenue of the Americas, Fourth Floor, New York, NY 1009  
[www.bluestarindexes.com](http://www.bluestarindexes.com)

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## Chapter 1: Introduction and Index Description

This document summarizes the methodology and rules used to construct, calculate, and maintain the BlueStar IoT Index (“BIOT”).

BIOT is a rules-based index that tracks the performance of a group of globally-listed stocks of companies that, according to BlueStar Indexes, are involved directly in what is known as the Internet of Things in the following capacities: building intelligence into devices; connectivity of devices to networks; and the management of big data and network capacity to facilitate the adoption and functionality of connected devices.

Companies may not apply and may not be nominated for inclusion in the Index. Companies are added or removed by BlueStar based on BlueStar’s proprietary industry research and the methodology described herein. The BlueStar Index Advisory Committee advises on the development of the index methodology and oversees that the index adheres to the stated methodology over time. Whenever possible, BlueStar will publicly announce changes to the index on its website at least five trading days in advance of the actual change. The Index is published, calculated and distributed by Solactive AG based on a methodology developed by BlueStar.

BIOT is calculated on a price, total return, and net total return basis in real-time. The index is denominated in USD. The net total return hedged index is disseminated in real-time via the price marketing services of Boerse Stuttgart AG every day the exchange of at least one index component is open. Real-time index values for the net total return index are available on Bloomberg by entering “BIOTUNTR INDEX <GO>”, and end-of-day values are freely available on BlueStar’s website, [www.bluestarindexes.com](http://www.bluestarindexes.com), and [www.solactive.com](http://www.solactive.com).

## Chapter 2: Index Construction

This chapter outlines and defines the key steps in constructing and calculating the index, including: eligibility requirements, formulas, initial component selection, and special adjustments

### 2.1 Base Date and Value

BIOT has the following variants, base dates and values:

Name	Index Symbol	Base Date	Base Value
BlueStar IoT Index (Price Index)	BIOTU	Dec. 28, 2012	100
BlueStar IoT Index Total Return	BIOTUTR	Dec. 28, 2012	100
BlueStar IoT Index Net Total Return	BIOTUNTR	Dec. 28, 2012	100

### 2.2 Component Eligibility Requirements

All the following requirements must be met for a company's security to be included in BIOT:

1. BlueStar screens a universe of roughly 10,000 global securities for companies whose primary business activity is directly involved in IoT in one of the following capacities: (1) Embedded Systems and Sensors; (2) Multi Service, Edge and FoG Computing; Core Network, Data Center and Cloud; Application-Level and Consumer Products. Collectively, companies involved in those fields are referred to as IoT companies. BlueStar screens company descriptions on bona-fide sources, company annual filings and websites to identify the global universe of IoT companies.
2. Companies included in the global universe of IoT companies are then screened to meet Index market capitalization and liquidity criteria. Only those companies included in the global universe of IoT companies which have a 20-day average bid-ask spread less than 1%, have a free-float percentage greater than 10%, float-adjusted market capitalization of at least \$100 million USD equivalent and a six-month average daily value traded of at least \$250,000 USD equivalent will be selected for inclusion in the index. For securities that do not have six months of average daily value traded data available, three months of data will be used and their eligibility for inclusion will be reviewed by the BlueStar Index Advisory Committee, which will consider factors such as liquidity over the time frame for which data is available and market capitalization.
3. Securities denominated only in the following currencies may be included in the index:

Currencies			
US Dollar	Euro	Canadian Dollar	Japanese Yen
British Pound	Israeli Shekel	Hong Kong Dollar	Swiss Franc

4. For existing components to be removed from the index, they must fail to meet investability in 2.2.2, above, for two consecutive rebalance periods, or any other investability criteria only at the current rebalance period.

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5. Companies that were previously removed from the index must meet investability criteria in 2.2.2, above, for two consecutive rebalance periods in order to be eligible for re-entry into the index.

## 2.3 Initial Component Selection

The following steps are taken to select the initial components for BIOT at each semi-annual rebalance period:

1. Establish the list of index components according to Chapter 2.2
2. Determine the index weight of each security in the list of index components:
  - a. Categorize each index component into one of the following categories:
    - i. Embedded Systems and Sensors
    - ii. Multi-Service, Edge and FoG Computing
    - iii. Core Network, Data Center, and Cloud
    - iv. Application-Level and Consumer Product
  - b. Assign each component an Initial Weight (IW) as follows:

$$W'A_i = 0.50 * \left(\frac{1}{N_A}\right) \text{ AND } W'B_i = 0.30 * \left(\frac{1}{N_B}\right) \text{ AND } W'C_i = 0.10 * \left(\frac{1}{N_C}\right) \text{ AND } W'D_i = 0.10 * \left(\frac{1}{N_D}\right)$$

Where:

$W'A_i$  = Initial Weight for Embedded Systems & Sensors component  $i$   
 $W'B_i$  = Initial Weight for Multi-Service, Edge, FoG component  $i$   
 $W'C_i$  = Initial Weight for Cor Network, Data Center, Cloud component  $i$   
 $W'D_i$  = Initial Weight for Application-Level and Consumer Product component  $i$   
 $N_A$  = Total number of Embedded Systems & Sensors components  
 $N_B$  = Total number Multi-Service, Edge and FoG components  
 $N_C$  = Total number of Core Network, Data Center and Cloud components  
 $N_D$  = Total number of Application-Level and Consumer Product components

- c. Set each component's maximum weight (MAXW) to its USD-equivalent 6-month average daily value/\$100 million
- d. If any components IW is greater than its MAXW, set that component's weight to MAXW and redistribute evenly among remaining members of its respective group to find each companies' modified IW (MIW)
- e. If the aggregate MIW of securities denominated in US Dollars (USD) is greater than or equal to 80% then the weights as determined in step 2.b, above, will be each component's Final Weight
- f. If the aggregate MIW of securities denominated in US Dollars (USD), as determined in step 2.b, above, is less than 80% then find each component's Final Weight by redistributing the weight of non-USD-denominated (NUSD) such that the aggregate weight of USD-denominated securities is equal to 80% as follows:

$$W_{USD_i} = W'_{USD_i} + DIST_{USD} \quad \text{AND} \quad W_{NUSD_i} = W'_{NUSD_i} - DIST_{NUSD}$$

Where:

$$DIST_{USD} = \frac{.80 - AW_{USD}}{N_{USD}} \quad \text{AND} \quad DIST_{NUSD} = \frac{.80 - AW_{USD}}{N_{NUSD}}$$

And:

- $W_{USD}$  = Final Weight of USD-denominated index components
- $W_{NUSD}$  = Final Weight of non-USD-denominated index components
- $W'_{USD_i}$  = Initial Weight of USD-denominated index components
- $W'_{NUSD_i}$  = Initial Weight of non-USD-denominated index components
- $DIST_{USD}$  = Weight to be added to each USD-denominated index component
- $DIST_{NUSD}$  = Weight to be subtracted from each non-USD-denominated index component
- $AW_{NUSD}$  = Aggregate Initial Weight of USD-denominated index components
- $N_{USD}$  = Total number of USD-denominated index components
- $N_{NIT}$  = Total number of non-USD-denominated index components

## 2.4 Dividend Treatment

The price index does not take normal dividend payments into account. Dividends are accounted for by reinvesting them daily. BIOT uses the ex-dividend date to determine the total daily dividends for each day. Special dividends require an index advisor adjustment, as described in Chapter 3, to prevent such distributions from distorting the price index.

## 2.5 Index Equations

1. The price index is calculated using the following basic equations:

$$I_{(t)} = \frac{\sum_{i=1}^n P_{i(t)} * S_{i(t)}}{D_{(t)}}$$

Where:

$I_{(t)}$  = Index value at time  $(t)$   
 $D_{(t)}$  = Divisor at time  $(t)$   
 $n$  = Number of stocks in the index  
 $t$  = The time that the index is calculated  
 $P_{i(t)}$  = Price of stock  $i$  at time  $t$  in USD terms  
 $S_{i(t)}$  = Number of assigned shares of stock  $i$  at time  $t$

Where:

$$D_{(t)} = \frac{\sum_{i=1}^n P_{i(t-1)} * S_{i(t-1)}}{I_{(t-1)}}$$

Where:

$I_{(t-1)}$  = Index value at time  $t-1$   
 $D_{(t)}$  = Divisor at time  $t$   
 $n$  = Number of stocks in the index  
 $P_{i(t-1)}$  = Closing price of stock  $i$  at time  $t-1$  in USD terms  
 $S_{i(t-1)}$  = Number of assigned shares of stock  $i$  at time  $t-1$

Where:

$$D_{(0)} = \frac{\sum_{i=1}^n P_{i(0)} * S_{i(0)}}{I_{(0)}}$$

Where:

$I_{(0)}$  = Index value at time  $0$  100  
 $D_{(0)}$  = Divisor at time  $0$   
 $n$  = Number of stocks in the index  
 $P_{i(t-1)}$  = Closing price of stock  $i$  at time  $0$  in USD terms  
 $S_{i(t-1)}$  = Number of assigned shares of stock  $i$  at time  $0$

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2. Assigned shares are the number of shares needed for each component such that the component conforms to the weighting distribution outlined in Chapter 2.3.2
3. Changes to the index composition require divisor adjustments to retain index continuity before and after specific events, as outlined in Chapter 3. Divisor changes are made according to the following equation:

$$D_{(t+1)} = D_{(t)} * \frac{\sum_{i=1}^n P_{i(t+1)} * S_{i(t+1)}}{\sum_{i=1}^n P_{i(t)} * S_{i(t)}}$$

Where:

$D_{(t+1)}$  = Initial Divisor after changes are made to the index

## Chapter 3: Index Maintenance

This chapter describes the circumstances that require index changes, as well as the details on performing those changes

### 3.1 Divisor Changes

Changes to the index composition due to corporate actions or component eligibility changes will require adjustments to the index divisor, as follows:

#### *Spinoff\**

1. Subtract the following from the price of the parent company:

$$\frac{\text{Spinoff stock price}}{\text{Share exchange ratio}}$$

2. Adjust the component's assigned shares such that its weighting is not changed because of the spinoff

#### *Special Cash Dividend*

1. Subtract special dividend from share price

#### *Rights Offering*

1. Subtract the following from the price of the parent company:

$$\frac{\text{Price of rights}}{\text{Rights ratio}}$$

2. Adjust the component's assigned shares such that its weighting is not changed because of the rights offering

Divisor changes are usually made on the date the corporate action becomes effective. For example, BIOT uses the ex-dividend date rather than the payment date to determine when making divisor adjustments.

\*If a company being spun-off is only trading on a "when-issued" basis, the "when-issued" price will be used to adjust the parent company's closing price.

### 3.2 Details of Share Changes

Stock splits and reverse splits do not require index divisor adjustments because the corresponding change to the stock price equally offsets the number of assigned shares, therefore not affecting the component's influence in the index.

### 3.3 Scheduled Component Changes and Review

BIOT has a semi-annual review in June and December of each year. Fundamental data, prices and trading volumes are captured on the Selection Date which is the first Thursday of June and December. The new number of assigned shares for each component is determined based on the component's weight as determined in 2.3 and the closing price of that component on the Selection Date. Component changes are announced and made available after the close on the second Thursday of June and December. Component changes are made after the close on the third Thursday of June and December and are effective at the opening on the third Friday of June and December.

### 3.4 Interim Component Changes

1. Component changes may occur between regularly-scheduled review periods if a specific corporate event makes an existing component ineligible. The following events may require a component's removal or replacement:

#### *Merger or Acquisition*

If a merger or acquisition results in one component absorbing another, the resulting company will remain a component and the absorbed company will be removed or replaced. If a non-component company absorbs a component company, the original component will be removed, unless the non-component company, after absorbing the assets of the component company, would be considered a IoT company as described in Chapter 2.2. If a component is the target of an acquisition BlueStar may decide to remove or reduce the weight of that component after the "go-shop" period concludes in order to reduce potential volatility or liquidity risk in the index.

#### *Spin-Off*

If a company splits or spins off a portion of its business to form one or more new companies, the resulting company with the highest market value will remain a component if it meets the eligibility requirement. The remaining companies will be evaluated for eligibility and possible addition to the index.

#### *Bankruptcy*

A component company will be removed and replaced immediately after bankruptcy filing. Exceptions are made on a case-by-case basis. For example, a security may not be removed immediately if bankruptcy filing is not the result of operating or financial difficulties.

#### *Delisting*

A component company will be removed or replaced immediately after being delisted from its primary market.

Whenever possible, interim component changes are announced on BlueStar's publicly-available website at least three trading days prior to component changes becoming effective.

## Chapter 4: Index Calculation and Dissemination

This chapter summarizes calculation and dissemination practices, quality assurance practices, and the circumstances requiring calculation corrections.

### 4.1 Price Calculation

Price, total return, net total return, and net total return hedged indexes for BIOT are calculated by Solactive AG on both an end-of-day and real-time basis. The BIOT is calculated using the last traded price for each company in the Index from the relevant exchanges and markets.

### 4.2 Calculation Frequency and Dissemination

BIOT is calculated on a real-time basis beginning when the first traded price of any of the Index components is received by Solactive AG. Prices are delivered to Boerse Stuttgart AG every 15 seconds and subsequently published at that frequency. Net total return index values are available on a real-time basis through the Bloomberg information system under the index symbol "BIOTUNTR INDEX". End-of-day net total return hedged index values are posted on BlueStar's publicly available website, [www.bluestarindexes.com](http://www.bluestarindexes.com), and [www.solactive.com](http://www.solactive.com).

If the exchange a stock is listed on is closed or if trading in a stock is suspended prior to the market opening, the stock's adjusted closing price from the previous day will be used in the Index calculation until trading commences. If trading in a stock is suspended while the relevant market is open, the last traded price for that stock will be used for all subsequent Index calculations until trading resumes.

### 4.3 Input Data

Solactive AG uses various quality assurance tools to audit, monitor, and maintain the accuracy of its input data. While every reasonable effort is taken to ensure high standards of data integrity, there is no guarantee against errors. Please refer to the Data Correction section for more detail.

The index closing price is calculated using the closing prices issued by the primary exchange for each component stock in the index. If the primary exchange changes the closing price of a component stock, the new price will be used to calculate the index closing price. Real time index prices are calculated using spot prices for foreign exchange rates throughout each trading day. Official end-of-day index values are calculated using Reuters spot rates which are captured at 12:00 GMT.

### 4.4 Data Corrections

Incorrect index component data, corporate action data, or Index Divisors will be corrected upon detection. If such errors are discovered within five days of occurrence, they will be corrected that same day. If discovered after five days, adjustments will be handled on a case-by-case basis depending on the significance of the error and the feasibility of a correction.

Incorrect intraday index tick data will not be corrected. However, incorrect opening and closing values will be corrected as soon as possible after detection.

## Appendices

This section provides additional information related to BIOT as well as changes to this document.

## Appendix A. BlueStar IoT Index Constituents

As of December 15, 2017

Company Name	Ticker	Exchange	Weight
Forescout Technologies Inc	FSCT	Nasdaq	2.43%
Rambus Inc	RMBS	Nasdaq	2.43%
Interdigital Inc	IDCC	Nasdaq	2.43%
Zebra Technologies Corp-cl A	ZBRA	Nasdaq	2.43%
Citrix Systems Inc	CTXS	Nasdaq	2.43%
Qualcomm Inc	QCOM	Nasdaq	2.43%
Cisco Systems Inc	CSCO	Nasdaq	2.43%
Intel Corp	INTC	Nasdaq	2.43%
Johnson Controls Internation	JCI	NYSE	2.43%
Intl Business Machines Corp	IBM	NYSE	2.43%
Sigma Designs Inc	SIGM	Nasdaq	2.20%
Dsp Group Inc	DSPG	Nasdaq	2.20%
Impinj Inc	PI	Nasdaq	2.20%
Ceva Inc	CEVA	Nasdaq	2.20%
Netgear Inc	NTGR	Nasdaq	2.20%
Ambarella Inc	AMBA	Nasdaq	2.20%
Itron Inc	ITRI	Nasdaq	2.20%
Silicon Laboratories Inc	SLAB	Nasdaq	2.20%
Cypress Semiconductor Corp	CY	Nasdaq	2.20%
Skyworks Solutions Inc	SWKS	Nasdaq	2.20%
Analog Devices Inc	ADI	Nasdaq	2.20%
Nxp Semiconductors Nv	NXPI	Nasdaq	2.20%
Texas Instruments Inc	TXN	Nasdaq	2.20%
Nvidia Corp	NVDA	Nasdaq	2.20%
Badger Meter Inc	BMI	NYSE	2.20%
Sensata Technologies Holding	ST	NYSE	2.20%
Avery Dennison Corp	AVY	NYSE	2.20%
Schneider Electric Se	SU	EN Paris	1.98%
Telit Communications Plc	TCM	London	1.98%
Sierra Wireless Inc	SW	Toronto	1.98%
Stmicroelectronics Nv	STM	Brsaltaliana	1.75%
China E-wallet Payment Group	802	Hong Kong	1.75%
Ams Ag	AMS	SIX Swiss Ex	1.75%
Arad Ltd	ARD	Tel Aviv	1.75%
Yaskawa Information Systems	2354	Tokyo	1.75%
Core Corp	2359	Tokyo	1.75%
Sato Holdings Corp	6287	Tokyo	1.75%
Attunity Ltd	ATTU	Nasdaq	1.12%
Amdocs Ltd	DOX	Nasdaq	1.12%
Ericsson (Lm) Tel-sp Adr	ERIC	Nasdaq	1.12%
Amazon.Com Inc	AMZN	Nasdaq	1.12%
Microsoft Corp	MSFT	Nasdaq	1.12%
Alphabet Inc-cl A	GOOGL	Nasdaq	1.12%
Nokia Corp-spon Adr	NOK	NYSE	1.12%
Vmware Inc-class A	VMW	NYSE	1.12%
Sap Se-sponsored Adr	SAP	NYSE	1.12%
Oracle Corp	ORCL	NYSE	1.12%
Samsung Electr-gdr	SMSN	London Intl	0.71%
Pointer Telocation Ltd	PNTR	Nasdaq	0.71%
Alarm.Com Holdings Inc	ALRM	Nasdaq	0.71%
Dexcom Inc	DXCM	Nasdaq	0.71%
Garmin Ltd	GRMN	Nasdaq	0.71%
Apple Inc	AAPL	Nasdaq	0.71%
Fitbit Inc - A	FIT	NYSE	0.71%
Emerson Electric Co	EMR	NYSE	0.71%
Honeywell International Inc	HON	NYSE	0.71%
General Electric Co	GE	NYSE	0.71%
Ned Apparaten Fabriek- Nedap	NEDAP	EN Amsterdam	0.26%
Legrand Sa	LR	EN Paris	0.26%
Wasion Group Holdings Ltd	3393	Hong Kong	0.26%
Landis+gyr Group Ag	LAND	SIX Swiss Ex	0.26%
Abb Ltd-reg	ABBN	SIX Swiss Ex	0.26%
Jig-saw Inc	3914	Tokyo	0.26%
Siemens Ag-reg	SIE	Xetra	0.26%

## Appendix B. Index Stats and Allocations

As of December 15, 2017

Currency	Weight	Count	GICS Sector	Weight	Count	IoT Category	Weight	Count
USD	80.00%	47	Information Technology	83.30%	49	Embedded Systems & Sensors	49.72%	24
JPY	5.51%	4	Industrials	11.96%	11	Multi Service Edge/FOG	30.20%	13
EUR	4.50%	5	Materials	2.20%	1	Core Network, Data Center and Cloud	11.20%	10
CHF	2.27%	3	Consumer Discretionary	1.83%	2	Application Level and Consumer	8.88%	17
HKD	2.01%	2	Health Care	0.71%	1			
GBp	1.98%	1						
CAD	1.98%	1						
ILs	1.75%	1						

## Appendix C. Document Change History

A history of significant changes to this document is shown in the table below

Issue	Effective Date	Change
1.0	January 26, 2018	Initial publication
1.1	December 14, 2018	Maximum bid-ask spread for inclusion
1.2	December 20, 2019	<ol style="list-style-type: none"> <li>1. Change market cap selection criteria to free-float market cap</li> <li>2. Add liquidity overlay to weighting strategy</li> <li>3. Change to rebalance schedule</li> <li>4. Addition of 2-step removal and re-entry procedure</li> <li>5. Removal of triggered rebalance.</li> </ol>

## Appendix D. Supplemental Documents

[Solactive AG's currency hedged index mathematics.](#)

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