DLIB <GO>
QUICK START GUIDE

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Bloomberg

CONTENTS

OVERVIEW

Derivatives Library, DLIB <GO>, allows you to price exotic hybrid derivatives linked to baskets of equity shares, indexes, FX Rates, Libor and CMS Rates using Bloomberg multi-dimensional Monte Carlo pricing system. Here are some of the main features of DLIB.

» Seamless integration with market data across Bloomberg including Interest Rate Curves (ICVS), Swaption/Caps Volatility Cubes (VCUB), Equity & FX Implied Volatility Surface (OVDV), Dividend Projections(BDVD), Correlations (CORR) and FX Forwards(FRD).

» Ability to structure deals using easy to use templates which are flexible and cover a broad set of deals across asset classes.

» Deals which are not available in standard templates can be created using an easy to use scripting language called BLAN.

» Advanced lifecycle handling showing past fixings and cash-flows, future events like barriers and call decisions and detailed cash-flow information like payoff formulas and certainty.

» Dealer quality models across all asset classes with easy to use options for selecting instruments for calibration, viewing and editing model parameters and analysing calibration errors.

» Scenario and SHOC Analysis.

» Integration to MARS for calculating prices, basic Greeks and scenarios.

» Automatic term sheet generation with ability to customize logos and add custom fields.

PRODUCT LIST

Open DLIB <GO> to see the list of products covered. The products are grouped by asset class. The following table gives a brief description for each product.
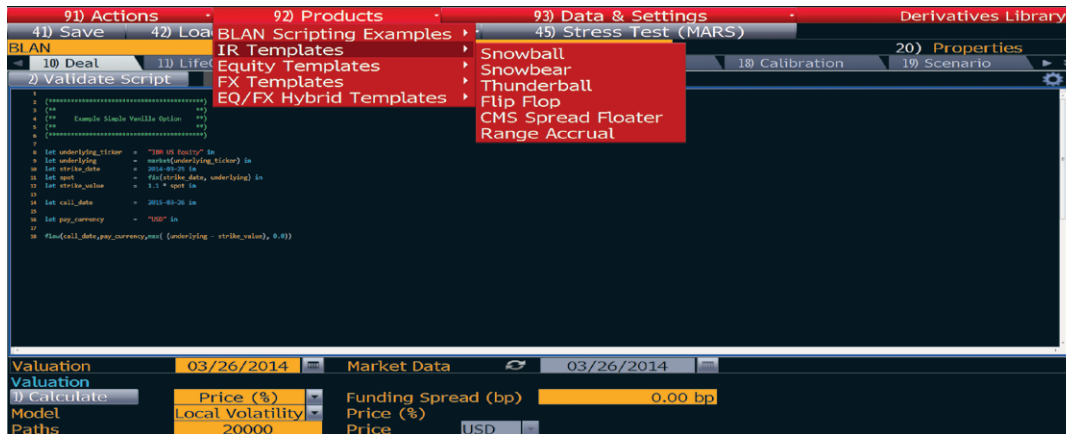
BLOOMBERG LANGUAGE

BLAN is an easy to use language for describing financial contracts. Users will not have to learn too many keywords in order to start scripting. The following are a list of keywords that need to be learnt in order to get started with scripting. This however is not a user guide to learn BLAN. The details for each keyword can be found in {HELP DLIB <GO>}

STRUCTURING & PRICING DEALS

Contract Details

For the template deals, all deal parameters are displayed in the "Deal" tab. Schedules are folded by default and can be opened by clicking on the "+" sign near the Schedule name. The content in the main tab can be dynamically resized using the zoom slider or by using Ctrl + Mouse Wheel or Shift + Mouse Wheel. To price the deal, user can modify all values and hit <GO>, then 1 <GO> to Calculate.

Valuation Panel

The valuation panel at the bottom of the screen displays information on pricing parameters and basic results. This can be useful to perform a quick pricing on the selected product. More results, including Greek numbers, can be found in the Pricing/Greeks Tab. In the Valuation Panel, the user can change the market data date and valuation date, as well as adjust pricing settings such as Model/Path/Funding Spread/etc.

Pricing Tab

The Pricing Tab allows users to set more pricing parameters like monte carlo time steps and visualize pricing and Greeks numbers.


Greeks numbers in all models require relevant calculation power that can materially increase response time. For this reason Greeks are switched off by default. User can switch the calculations of Greeks on, by clicking on button 33) Greeks settings. A popup will appear where preferences for Greeks calculations (including parameters shifts) can be customized.


In addition to showing the price for a deal, DLIB provides other details like standard deviation, expected coupon payments, expected call payments, greeks etc in the Results tab.

DLIB shows detailed breakdown of the price calculated during simulation by showing cashflows paid during each coupon period, computing expressions based on underlying like survival probability, barrier hit percentage etc and computing forwards computed from monte carlo simulation. This is shown in the MC Projections tab.
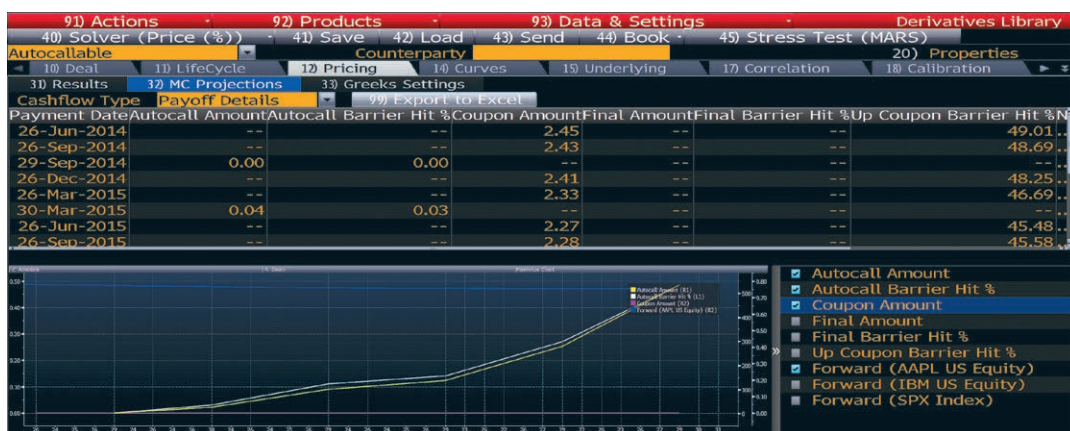
LIFECYCLE HANDLING

Lifecycle tab in DLIB allows users to view and edit historical fixings, view future cashflows, manage lifecycle events like continuous barrier and call options and in certain cases handle corporate events gracefully.
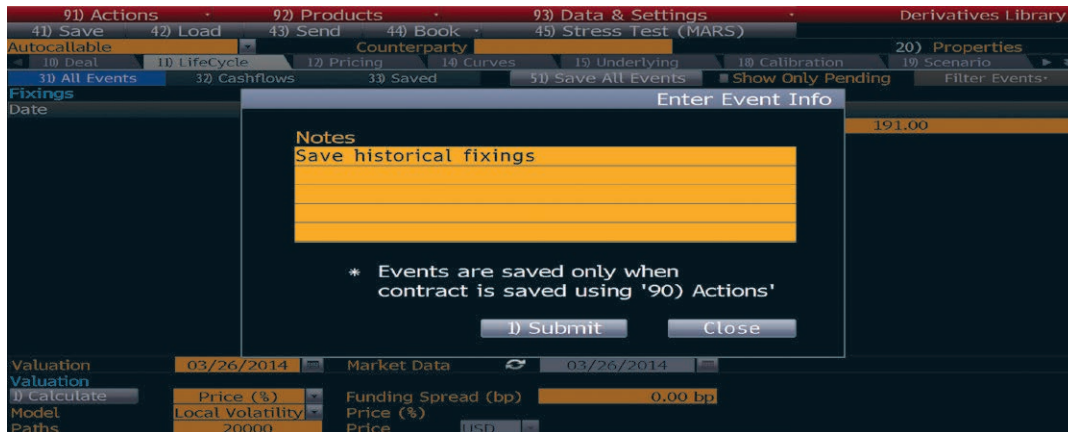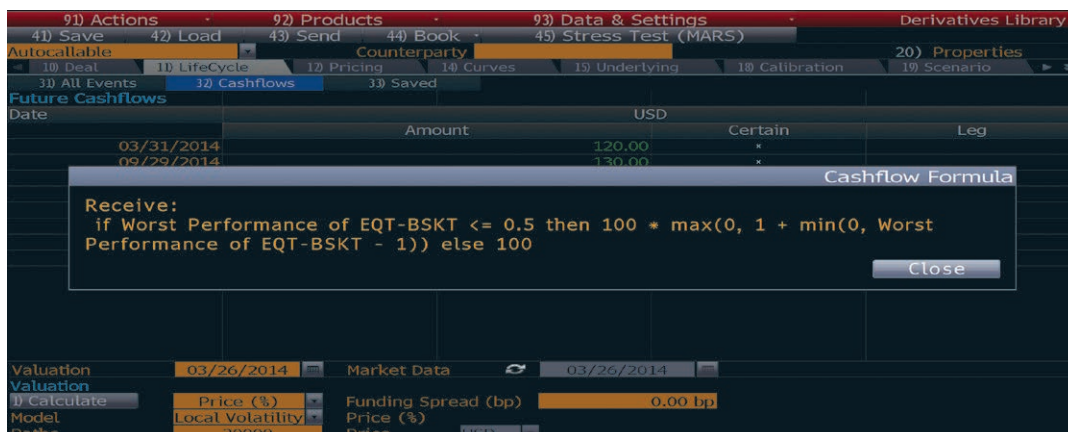

Historical Fixings

All Events section would show the historical fixings whenever application. The user can edit the fixings and save it with the deal.

FUTURE CASHFLOWS

The user can view all the cashflows which occur in the future and if the cashflows are certain or are dependent on the path of the underlying.

CONTINUOUS BARRIERS & OTHER EVENTS

In case the contract has continuous barriers starting in the past, user can specify if the barrier has been hit during lifecycle of the deal. As shown below specifying that the barrier has been hit updates the formula in lifecycle.
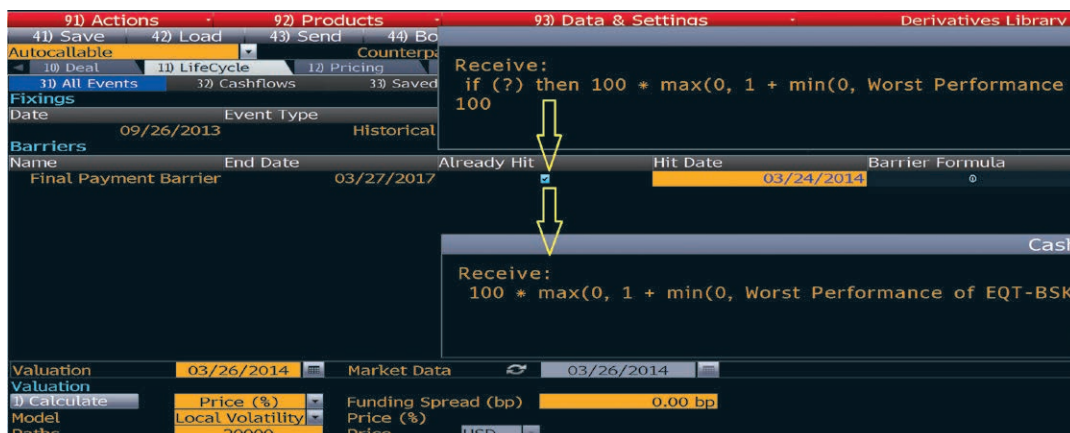
CORPORATE ACTIONS

DLIB automatically handles corporate actions like ticker changes and stock splits. These events can be viewed in the lifecycle tab. DLIB displays a list of corporate actions that may affect the stock price, including stock splits and ticker changes. Each action is linked to the Corporate Actions Calendar function (CACX). Clicking the button next to the action launches CACX, which displays further information on the action.

» **Stock Split –** Occurs when a stock share is split into two, or stock shares are merged into one. In the example below, you can see that MSFT US <EQUITY> split multiple times since 1988.

» **Ticker Change –** Occurs when the ticker of a company changes before the market data date. In the example below, the ticker change from RIMM US <EQUITY> to BBRY US <EQUITY> appears.

MARKET DATA

Curves Tab
The Curves Tab allows visualization and customization of some parameters of the interest rates curves used for pricing and calibration. The curve loading in DLIB is done keeping in mind users settings in functions like SWDF <GO> and ICVS <GO> functions.

Equity Tab
The Equity Tab allows visualization of Volatilities and Dividends and view the spot prices used in MC Simulation if the deal has equity underlyings. The user can also choose different volatility sources as available in OVDV and dividend sources which are available as part of OPDF. However, for Heston model only available dividend source is the implied dividend. The user also has the option to import custom volatility surface by clicking on the View tab. The volatility surface can either be manually edited or dragged and dropped from excel.

CORRELATION TAB & CORRELATION METHODOLOGY

For basket options and hybrid deals, DLIB allows users to get an accurate estimate of realized correlation. You can use either "Spot" correlations or correlations calculated using a "Rolling Windows" methodology. Settings can be adjusted in the Correlation tab. For more details on correlation methodology please refer to {IDOC 2065568 <GO>}

FX Tab

The FX tab is displayed in case of Quanto deals or if FX rate is one of the underlying. The FX tab allows user to choose Forward curve from FRD and volatility surface from OVDV. It also lets user to imply one of the discount curves from the FX forward and other discount curve.

IR Tab

The IR tab is displayed in case of Libor or CMS Index is one of the underlying. This tab allows user to view Forward curve and choose volatility surface from VCUB.

MODEL CALIBRATION

DLIB allows flexibility in creating models used for pricing a deal. The detailed calibration process allows users to select instruments for calibration (where ever appropriate), view model parameters and analyse errors for vanilla market instruments between models computed prices vs market quoted prices.

For more details on Black Scholes, Local Volatility and Heston model please refer to {DOCS #2071537 <GO>}

For more details on Hull White and Libor Market Model model please refer to {DOCS #2071536 <GO>}

SCENARIO

The Scenario Tab provides two types of market data shift analysis: range shift and SHOC shift.

Asset Type	Y-Axis Options	X-Axis Options
Equity	Price	Equity Spot
	Price(%)	Equity Volatility Surface
	Delta	Equity Dividend
	Gamma	Curve for ticker Currency
	Vega	Curve for deal Currency
	Rho	
FX	Price	FX Spot
	Price(%)	FX Volatility Surface
	Delta	Curve for non-implied currencies
	Gamma	
	Vega	
	Rho	
Libor/CMS	Price	Curve for Libor Currency
	Price(%)	Curve for Deal Currency
	DV01 (termed as Rho)	
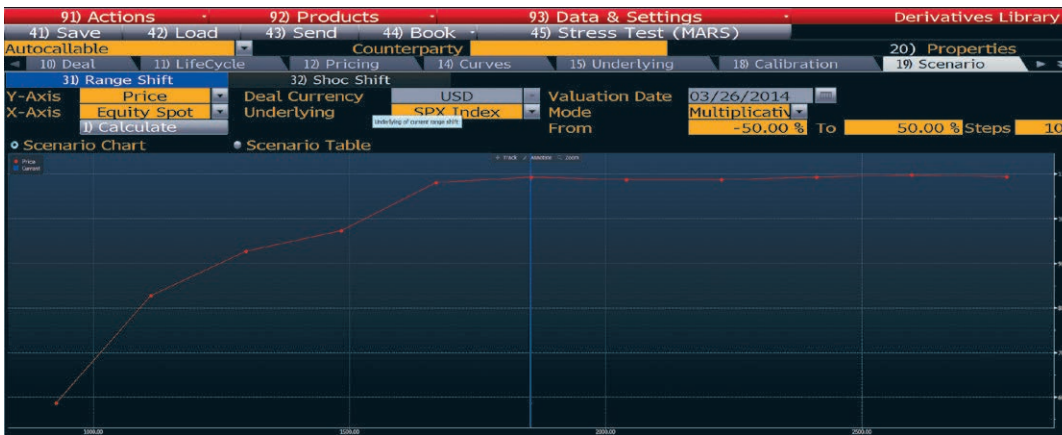
Range Shift

A range shift computes multiple pricing results with shifts from a single market data. The options available in DLIB are

SHOC Shift

A SHOC shift calculates a single pricing result based on multiple market data shifts. We provide 4 individual SHOC shifts that are computed in one calculation. All available market data shifts are presented in each shift column for users to configure. Each shift has two associated fields of shift mode and shift value. They define how shift is applied and what value is used, individually. The preconfigured SHOCs in the dropdown menu are loaded from the SHOC database and accessible from SHOC function.

Interest Rate Deals

Product	Description	Payoff Formula	Other Features
Snowball	Pays a coupon which increases over time in a bullish market when interest rates fall	Coupon = Prev Coupon − Index Rate + Spread	» Intro Coupon initially » Caps, Floor for Coupons » Option to cancel the deal » Quanto
Snowbear	Pays a coupon which decreases over time in a bullish market when interest rates fall	Coupon = Index Rate − Prev Coupon + Spread	» Intro Coupon initially » Caps, Floor for Coupons » Option to cancel the deal » Quanto
Thunderball	Pays a coupon which is difference between previous coupon and current index level multiplied by a gearing factor	Coupon = Leverage *(Prev Coupon − Index Rate) + Spread	» Intro Coupon initially » Caps, Floor for Coupons » Fully customizable formula dependent on previous coupon and current index level » Option to cancel the deal » Quanto
Flip Flop	Start with Fixed/ Float coupon for a period of time and shift to Float/Fixed coupon	Coupon = Fixed Rate/Index Rate + Spread	» Intro Coupon initially » Caps, Floor for Float Coupons » Option to cancel the deal » Quanto
CMS Spread Options	Pays coupon based on the spread between two index rates of a particular currency. The index rate can be two Libor rates or two CMS rates	Coupon = Index Rate1 − Index Rate2	» Intro Coupon initially. » Caps, Floor for Float Coupons » Option to cancel the deal » Quanto
Range Accrual	Pays coupon based on percentage of the time basket of underlyings exceed a given range	Coupon = Fixed/Float Rate * Percentage of time underlyings exceed a range	

Equity-FX Hybrid Deals

Product	Description	Payoff Formula	Other Features
PRDC	Pays a coupon based on FX Forward	Coupon = Foreign Cpn *FX Rate/Strike − Base Coupon	» Intro Coupon initially. » Caps, Floor for Coupons » Option to cancel the deal » Quanto
Basket Option	Vanilla Option based on function of performance of basket of underlyings. The function could be best of/ worst of/ average/rainbow	Final Payment = Max (Basket Performance − Strike, 0)	» Caps, Floor for Performance of Each underlying » Asian/Lookback features » Quanto » Equity − FX Hybrids
Capital Protected	Vanilla Option based on function of performance of basket of underlyings. The function could be best of/ worst of/average/rainbow. Has a notional protection and participation	Final Payment = Protection *Notional + Max (Basket Performance − Strike, 0)	» Caps, Floor for Performance of Each underlying » Asian/Lookback features » Quanto » Equity − FX Hybrids
Stellar	Pays a coupon based on average performance of the basket	Coupon = Average performance of the basket	» Caps, Floor for Performance of Each underlying » Strike to calculate performance can be reset every period » Quanto » Equity − FX Hybrids
Call Spread Lock In	Pays a coupon based on average performance of the basket. Pays a minimum return if basket performance exceeds a barrier	Coupon = Notional *Max (LockInInterest, Min(BasketReturn, MaxReturn)) LockInInterest is 0 if BasketReturn is below a certain level	» Quanto » Equity − FX Hybrids
Autocap	Pays a coupon based on average performance of the basket. Pays a minimum return	Coupon = Notional *Max (Minimum Rate, BasketReturn)	» Caps, Floor for Performance of Each underlying » Strike to calculate performance can be reset every period » Quanto » Equity − FX Hybrids
Autocallable	Pays an amount at maturity based on worst performing underlying. There is also an option to early redeem the deal based on certain conditions		» Caps, Floor for Performance of Each underlying » Strike to calculate performance can be reset every period » Completely customizable final payoff as a function of calls, puts, forwards, digital options and cash » Quanto » Equity − FX Hybrids

Product	Description	Payoff Formula	Other Features
Phoenix	Pays an amount at maturity based on worst performing underlying. Pays a fixed coupon every period in case the worst performing underlying exceeds a certain barrier. There is also an option to early redeem the deal based on certain conditions		» Caps, Floor for Performance of Each underlying » Strike to calculate performance can be reset every period » Completely customizable final payoff as a function of calls, puts, forwards, digital options and cash » Quanto » Equity – FX Hybrids
Altiplano	Pays a fixed coupon based on number of underlying assets trading below a barrier		» Caps, Floor for Performance of Each underlying » Strike to calculate performance can be reset every period » Quanto » Equity – FX Hybrids
Reverse Convertible	Pays an amount at maturity based on worst performing underlying		» Caps, Floor for Performance of Each underlying » Strike to calculate performance can be reset every period » Quanto » Equity – FX Hybrids
Outperformance	Coupon based on difference in performance of two underlyings	Coupon = Und1 Performance – Und2 Performance – Strike	» Caps, Floor for Performance of Each underlying » Strike to calculate performance can be reset every period » Quanto » Equity – FX Hybrids
Best/Worst	Pays a coupon based on ordered average performance of the basket. Highest return in each period has a different weight than lowest return		» Caps, Floor for Performance of Each underlying » Strike to calculate performance can be reset every period » Quanto » Equity – FX Hybrids

BLAN Quick Guide

User	Language Features	Financial Keywords	Contracts Covered
Basic	**tuple –** Collection of variables which can be strings, dates, floats or another tuple **map –** Converts one set of tuple into another set of tuples	**market –** Create a observable from standard Bloomberg ticker **fix –** Fix the observable on a date in the past or future **flow –** Creates a cashflow to be paid in the past to future **give –** Revert the roles of the long and short position **all –** Combines a set of flows together to form a contract Math keywords like max, min, exp, log etc.	All non-path dependent deals can be priced using these keywords. Some examples are: » Fixed-Float Swap » Vanilla options, caps and floors » Stellar, Reverse Convertible, Autocaps with fixed strikes and single underlyings
Basic – Intermediate		**basket_of_tickers –** Create a tuple of performances from tuples of tickers and strike date **worst_of_basket –** Calculates the worst performance In basket **best_of_basket –** Calculates the best performance in basket **weighted_sum_of_basket –** Calculates the weighted average performance of basket	All non-path dependent basket options can be priced using these keywords. Some examples are Stellars, Reverse Convertibles, Autocaps, Call spread lock in.
Intermediate	**get –** Gets the ith element in the tuple. Useful for special processing of last schedule item. **len –** length of the tuple	**ifc –** Conditional contract providing choice between two contracts **notify –** Report the value of any float observable or expression based on float observable **barrier_crossed –** Continuously monitor barrier between two dates	Used to price deals with continuous or discrete barriers. Allows users to report certain variables for debugging.
Advanced	**fold_left –** Similar to map but aggregates results from left to right in the tuple. **fold_right –** Similar to map but aggregates results from right to left in the tuple.		Can price all path dependent deals without any early exercise features. Some examples include: 1) Snowball, snowbear, Thunderball 2) Autocalls and Phoenix 3) Stellar, Outperformance etc with Floating strike 4) Asian, lookback options
Expert		**either –** Make a decision to get into one of a given set of contracts by pricing future cashflows on exercise date and making a decision. **american_option –** American style exercise by choosing a contract between two **instrument_of –** Creates a contract by aggregating a series of either contracts along with the regression variables to be used in Least Squares /American Monte Carlo	All options with a european/bermudan /american style exercise can be priced using these keywords. For example: 1) Bermudan Cancellable Swaps 2) Bermudan Swaptions 3) American Options 4) POINT structure

ABOUT THE BLOOMBERG PROFESSIONAL SERVICE

The founding vision in 1982 was to create an information services, news and media company that provides business and financial professionals with the tools and data they need on a single, all-inclusive platform. The success of Bloomberg is due to the constant innovation of our products, unrivalled dedication to customer service and the unique way in which we constantly adapt to an ever-changing marketplace. The Bloomberg Professional service is a powerful and flexible tool for financial professionals—whatever their needs—in cash and derivatives markets as diverse as equities, currencies, commodities, money markets, government and municipal securities, mortgages, indices, insurance and legal information. The Bloomberg Professional service seamlessly integrates the very best in real-time data, news and analytics.

In addition, Bloomberg users benefit from on-demand multimedia content, extensive electronic trading capabilities and a superior communications platform. Bloomberg customers include influential decision makers in finance, business and government. Business and financial professionals recognize the Bloomberg Professional service as the definitive tool for achieving their goals because it offers unparalleled assistance and functionality on a single platform for a single price.

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