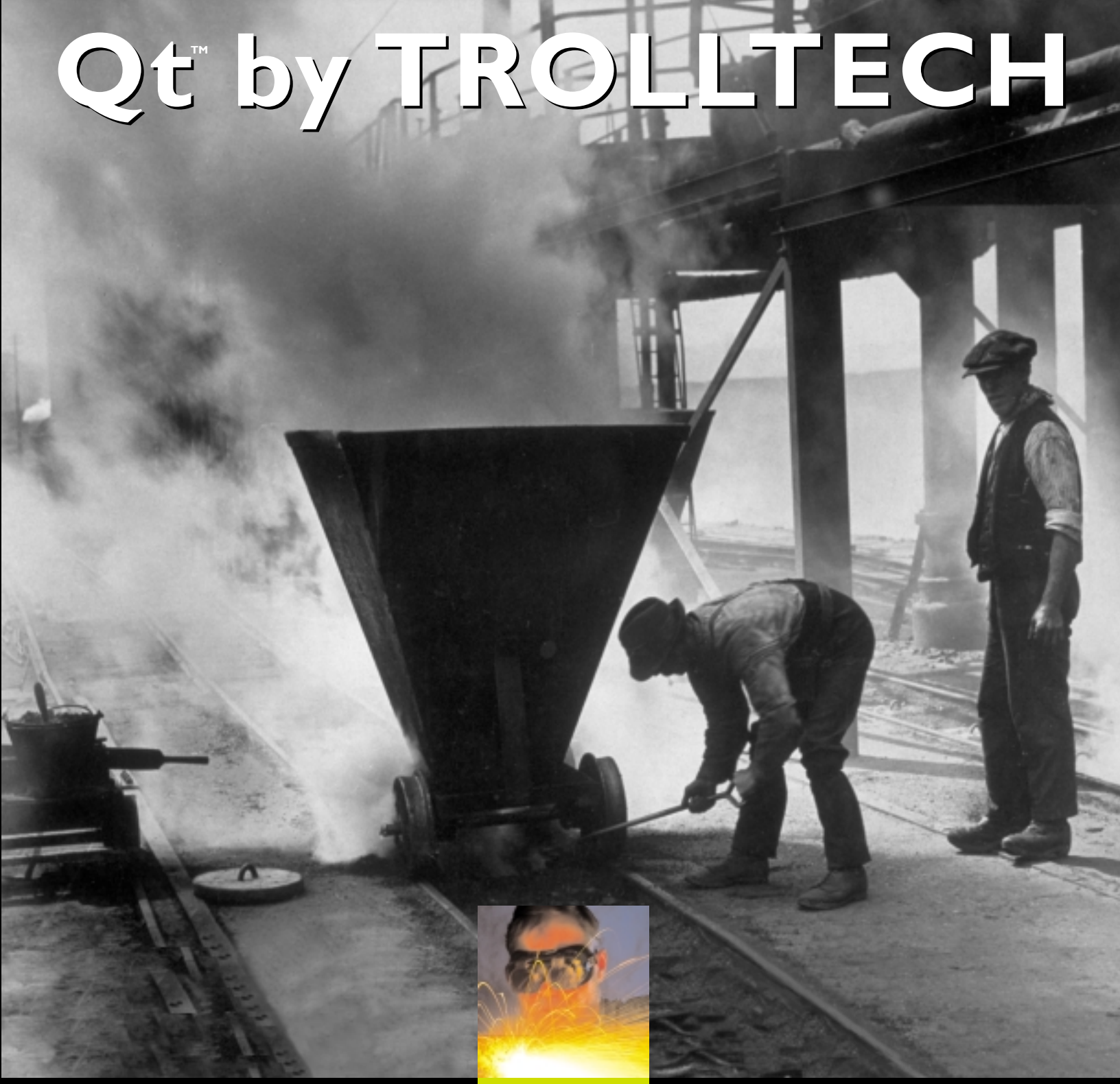
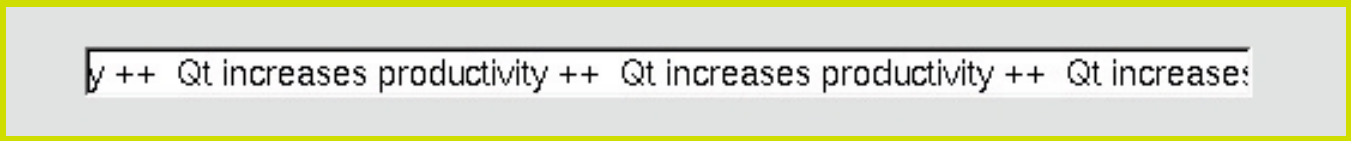
Qt™ by TROLLTECH



HOW MUCH WORK DO *YOU* WANT TO DO TODAY?

Question: How Much Code Does It Take To Build This Widget?



Answer: It Depends

This document contains the answer to the following question (in terms that any programmer or project manager can understand):

Which is the most efficient framework/ environment for building your next GUI—Qt, MFC, or MOTIF?

To find out, all you have to do is:

1. Open this page.

2. Read the code.

3. Read the Summation.

4. Draw your own conclusions.

MOTIF:

Test Score—224 loc

```
/* header */
#include <X11/Intrinsic.h>
extern WidgetClass tickerWidgetClass;
typedef struct _TickerClassRec *TickerWidgetClass;
typedef struct _TickerRec *TickerWidget;
#define XtNtext "text"
#define XtNspeed "speed"
#define XtCText "text"
#define XtCSpeed "speed"
#define XtNbasecolor "basecolor"
#define XtCBasecolor "basecolor"
#define XtNtextcolor "textcolor"
#define XtCTextcolor "textcolor"

/* implementation */
#include <stdio.h>
#include <math.h>
#include <X11/IntrinsicP.h>
#include <X11/Intrinsic.h>
#include <X11/StringDefs.h>
#include <Xm/PrimitiveP.h>
#define MAXSEGMENTS 200
typedef struct _TickerClassPart{
       int ignore;
} TickerClassPart;
typedef struct _TickerClassRec{
   CoreClassPart    core_class;
    XmPrimitiveClassPart  primitive_class;
    TickerClassPart  ticker_class;
} TickerClassRec;
extern TickerClassRec tickerClassRec;
typedef struct _TickerPart {
    char* text;
    int speed, offset;
    Pixel textcolor, basecolor;
    GC text_gc, scroll_gc;
    XFontStruct* font;
    XtIntervalId timer;
} TickerPart;
typedef struct _TickerRec {
    CorePart         core;
    XmPrimitivePart  primitive;
    TickerPart       ticker;
} TickerRec;
static void Initialize();
static void Redisplay();
static void Destroy();
static Boolean SetValues();
static XtResource resources[] = {
  {XtNtext, XtCText, XtRString, sizeof (unsigned char),
   XtOffset(TickerWidget, ticker.text), XtRString, "Hello" },
  {XtNspeed, XtCSpeed, XtRInt, sizeof (int),
   XtOffset(TickerWidget, ticker.speed), XtRString, "20"   },
  {XtNtextcolor, XtCTextcolor, XtRPixel, sizeof (Pixel),
   XtOffset(TickerWidget, ticker.textcolor), XtRString, "Black" },
  {XtNbasecolor, XtCBasecolor, XtRPixel, sizeof (Pixel),
   XtOffset(TickerWidget, ticker.basecolor), XtRString, "White" },
  {XtNfont, XtCFont, XtRFontStruct, sizeof (XFontStruct*),
   XtOffset(TickerWidget, ticker.font), XtRString, "Fixed" }
};
TickerClassRec  tickerClassRec = {
  {     /* CoreClassPart */
   (WidgetClass) &xmPrimitiveClassRec, /* superclass */
   "Ticker",                    /* class_name */
   sizeof(TickerRec),           /* widget_size */
   NULL,                        /* class_initialize */
   NULL,                        /* class_part_initialize */
   FALSE,                       /* class_inited */
   Initialize,                  /* initialize */
   NULL,                        /* initialize_hook */
   XtInheritRealize,            /* realize */
   NULL,                        /* actions */
   0,                           /* num_actions */
   resources,                   /* resources */
   XtNumber(resources),         /* num_resources */
   NULLQUARK,                   /* xrm_class */
   TRUE,                        /* compress_motion */
   TRUE,                        /* compress_exposure */
   TRUE,                        /* compress_enterleave */
   TRUE,                        /* visible_interest */
   Destroy,                     /* destroy */
   NULL,                        /* resize */
   Redisplay,                   /* expose */
   SetValues,                   /* set_values */
   NULL,                        /* set_values_hook */
   XtInheritSetValuesAlmost,    /* set_values_almost */
   NULL,                        /* get_values_hook */
   NULL,                        /* accept_focus */
   XtVersion,                   /* version */
   NULL,                        /* callback private */
   NULL,                        /* tm_table */
   NULL,                        /* query_geometry */
   NULL,                        /* display_accelerator */
   NULL,                        /* extension */
   },
  {0,},     /* Primitive class fields */
  {0,}      /* Ticker class fields */
};
WidgetClass tickerWidgetClass = (WidgetClass) &tickerClassRec;
static void Progress( XtPointer data, XtIntervalId* timer) {
    TickerWidget w = data;
    if ( --w->ticker.offset < -XTextWidth( w->ticker.font, w->ticker.text, strlen(w->ticker.text) ) )
```

```
    if ( --w->ticker.offset < -XTextWidth( w->ticker.font, w->ticker.text, strlen(w->ticker.text) ) )
                w->ticker.offset = 0;
    XCopyArea( XtDisplay(w), XtWindow(w), XtWindow(w), w->ticker.scroll_gc,
                    w->primitive.shadow_thickness+1, w->primitive.shadow_thickness,
                    w->core.width - 2* w->primitive.shadow_thickness - 1,
                    w->core.height - 2*w->primitive.shadow_thickness,
                    w->primitive.shadow_thickness, w->primitive.shadow_thickness );

    w->ticker.timer = XtAddTimeOut( w->ticker.speed, Progress, w );
    XClearArea( XtDisplay(w), XtWindow(w),
                        w->core.width - w->primitive.shadow_thickness - 2, w->primitive.shadow_thickness,
                        2, w->core.height - 2* w->primitive.shadow_thickness, True );
}
static void MapNotifyHandler(Widget w, XtPointer client_data,  XEvent *event, Boolean *cont) {
    TickerWidget ticker = (TickerWidget) w;
    if ( event->type = MapNotify  && ticker->ticker.timer == 0 ) {
                XSetWindowBackground( XtDisplay(w), XtWindow(w), ticker->ticker.basecolor );
                ticker->ticker.timer = XtAddTimeOut( ticker->ticker.speed, Progress, ticker );
    } else if ( event->type = UnmapNotify && ticker->ticker.timer == 0 ) {
                XtRemoveTimeOut( ticker->ticker.timer );
                ticker->ticker.timer = 0;
    }
}
static void Initialize ( TickerWidget request, TickerWidget new ) {
  XGCValues values;
  XtGCMask  valueMask;
  if (request->core.width == 0)
      new->core.width = 40*XTextWidth( new->ticker.font, "x", 1 );
  if (request->core.height == 0)
      new->core.height = new->ticker.font->ascent + new->ticker.font->descent
                                          + 2*new->primitive.shadow_thickness;
  valueMask = GCFont|GCForeground|GCBackground;
  values.font = new->ticker.font->fid;
  values.foreground = new->ticker.textcolor;
  values.background = new->ticker.basecolor;
  new->ticker.text_gc = XtGetGC ((Widget)new, valueMask, &values);
  valueMask = GCGraphicsExposures;
  values.graphics_exposures = True;
  new->ticker.scroll_gc = XtGetGC ((Widget)new, valueMask, &values);
  new->ticker.offset = 0;
  new->ticker.timer = 0;
  XtAddEventHandler( (Widget)new, StructureNotifyMask, False, MapNotifyHandler, NULL );
}
static void Destroy (TickerWidget w) {
    XtReleaseGC ((Widget)w, w->ticker.text_gc );
    XtReleaseGC ((Widget)w, w->ticker.scroll_gc );
    if ( w->ticker.timer )
                XtRemoveTimeOut( w->ticker.timer );
}
static void Redisplay ( TickerWidget w, XEvent *event, Region region) {
    int x;
    XSetRegion( XtDisplay(w), w->ticker.text_gc, region );
    XSetRegion( XtDisplay(w), w->primitive.top_shadow_GC, region );
    XSetRegion( XtDisplay(w), w->primitive.bottom_shadow_GC, region );
    for ( x = 0; x < w->core.width-w->primitive.shadow_thickness - w->ticker.offset;
                  x += XTextWidth( w->ticker.font, w->ticker.text, strlen(w->ticker.text) ) )
                XDrawString( XtDisplay(w), XtWindow(w), w->ticker.text_gc,
                                    2+x+w->ticker.offset,
                                    (w->core.height + w->ticker.font->ascent+2*w->primitive.shadow_thickness)/2,
                                    w->ticker.text, strlen( w->ticker.text ));
    XmeDrawShadows (XtDisplay (w), XtWindow (w), w->primitive.top_shadow_GC,
                                   w->primitive.bottom_shadow_GC, 0, 0,
                                   w->core.width, w->core.height,
                                   w->primitive.shadow_thickness, XmSHADOW_IN  );
}
static Boolean SetValues (TickerWidget current, TickerWidget request, TickerWidget new,
                                            ArgList args,  Cardinal *num_args) {
  XGCValues values;
  XtGCMask valueMask;
  Boolean redraw = False;
  if( new->ticker.textcolor != current->ticker.textcolor  ||
      new->ticker.font != current->ticker.font) {
      valueMask = GCFont|GCForeground|GCBackground;
      values.font = new->ticker.font->fid;
      values.foreground = new->ticker.textcolor;
      values.background = new->ticker.basecolor;
      XtReleaseGC((Widget)new, new->ticker.text_gc );
      new->ticker.text_gc = XtGetGC ((Widget)new, valueMask, &values);
      redraw = True;
  }
  if( new->ticker.basecolor != current->ticker.basecolor ) {
      if ( XtIsRealized((Widget)new) )
                XSetWindowBackground( XtDisplay((Widget)new), XtWindow((Widget)new), new->ticker.basecolor );
      redraw = True;
  }
  if ( new->ticker.text != current->ticker.text ) {
      new->ticker.text = strdup( new->ticker.text );
      redraw = True;
  }
  return (redraw);
}

/* usage */
int main( int argc, char* argv[] ) {
  Widget toplevel, ticker;
  Arg wargs[1];
  toplevel = XtInitialize(argv[0], "Ticker", NULL, 0, &argc, argv);
  ticker = XtCreateManagedWidget("ticker", tickerWidgetClass, toplevel, NULL, 0);
  XtSetArg(wargs[0], XtNtext, "Qt increases productivity ++ " );
  XtSetValues( ticker, wargs, 1 );
  XtRealizeWidget(toplevel);
  XtMainLoop();
  return(0);
}
```

Qt:

Test Score—61 loc

```
/* header */
#include <qframe.h>
#include <qtimer.h>
class Ticker : public QFrame{
    Q_OBJECT
    Q_PROPERTY( QString text READ text WRITE setText )
    Q_PROPERTY( int speed READ speed WRITE setSpeed )
public:
    Ticker( QWidget* parent = 0, const char* name = 0 );
    QString text() const { return txt; };
    void setText( const QString& text ) { txt = text; update(); }
    QSize sizeHint() const;
    void setSpeed( int speed );
    int speed() const { return s; }
protected:
    void showEvent( QShowEvent* ) { timer.start( s ); }
    void hideEvent( QHideEvent* ) { timer.stop(); }
    void drawContents( QPainter * p );
private:
    QString txt; QTimer timer; int offset, s;
private slots:
    void progress();
};

/* implementation */
#include <qpainter.h>
#include "ticker.moc"
Ticker::Ticker( QWidget* parent, const char* name )
    : QFrame( parent, name ), offset( 0 ), s( 20 ){
    setFrameStyle( WinPanel | Sunken );
    setBackgroundMode( PaletteBase );
    setSizePolicy( QSizePolicy( QSizePolicy::Expanding, QSizePolicy::Fixed ) );
    connect( &timer, SIGNAL( timeout() ), this, SLOT( progress() ) );
}
QSize Ticker::sizeHint() const {
    return QSize( 40*fontMetrics().width('x'),
                  fontMetrics().lineSpacing()+2*frameWidth());
}
void Ticker::setSpeed( int speed ) {
    s = speed;
    if ( timer.isActive() )
        timer.changeInterval(s);
}
void Ticker::drawContents( QPainter * p ) {
    for ( int x = 0; x < width() - offset; x += fontMetrics().width( txt ) )
        p->drawText( x + offset, 0, QWIDGETSIZE_MAX, height(), AlignVCenter, txt );
}
void Ticker::progress() {
    if ( --offset < -fontMetrics().width( txt ) )
      offset = 0;
    scroll( -1, 0, contentsRect() );
}

/* usage */
#include <qapplication.h>
int main( int argc, char* argv[] ) {
    QApplication a( argc, argv );
    Ticker ticker;
    a.setMainWidget( &ticker );
    ticker.setText(" Qt increases productivity ++ ");
    ticker.show();
    return a.exec();
}
```

MFC:

Test Score—164 loc

```
/* header */
#include "stdafx.h"
#include "resource.h"
class CTickerCtrl : public CWnd {
public:
	CTickerCtrl();
	void SetText( CString strText );
	CString GetText();
	void SetSpeed( int nSpeed );
	int GetSpeed();
private:
	CString m_strText;
	int m_nSpeed;
	UINT m_timer;
	int m_nOffset;
	void progress();
protected:
	afx_msg void OnPaint();
	afx_msg void OnShowWindow(BOOL bShow, UINT nStatus);
	afx_msg void OnTimer(UINT nIDEvent);
	afx_msg BOOL OnEraseBkgnd(CDC* pDC);
	afx_msg int OnCreate(LPCREATESTRUCT lpCreateStruct);
	DECLARE_MESSAGE_MAP()
};

/* implementation */
CTickerCtrl::CTickerCtrl() : m_nSpeed( 20 ), m_timer( 0 ), m_nOffset( 0 ) {};
BEGIN_MESSAGE_MAP(CTickerCtrl, CWnd)
	ON_WM_PAINT()
	ON_WM_SHOWWINDOW()
	ON_WM_TIMER()
	ON_WM_ERASEBKGND()
	ON_WM_CREATE()
END_MESSAGE_MAP()
void CTickerCtrl::OnPaint() {
	CRect rcClient;
	CPaintDC dc(this);
	GetClientRect( rcClient );
	dc.SetBkMode( TRANSPARENT );
	for( int x = 0; x < rcClient.Width() - m_nOffset; x += dc.GetTextExtent( m_strText ).cx )
	    dc.TextOut( x + m_nOffset, ( rcClient.Height() - dc.GetTextExtent( m_strText ).cy ) >> 1, m_strText );
	dc.Draw3dRect( rcClient, GetSysColor( COLOR_BTNSHADOW ), GetSysColor( COLOR_BTNHILIGHT ) );
}
void CTickerCtrl::OnShowWindow(BOOL bShow, UINT nStatus) {
	CWnd::OnShowWindow(bShow, nStatus);
	if( bShow )
	    m_timer = SetTimer( 1, m_nSpeed, NULL );
	else {
	    if( m_timer )
		KillTimer( m_timer );
	    m_timer = 0;
	}
}
CString CTickerCtrl::GetText() { return m_strText; }
void CTickerCtrl::SetText( CString strText ) { m_strText = strText; Invalidate(); }
int CTickerCtrl::GetSpeed() { return m_nSpeed; }
void CTickerCtrl::SetSpeed( int nSpeed ) {
    m_nSpeed = nSpeed;
    if( m_timer )
	KillTimer( m_timer );
    m_timer = SetTimer( 1, m_nSpeed, NULL );
}
void CTickerCtrl::OnTimer(UINT nIDEvent) {
	progress();
	CWnd::OnTimer(nIDEvent);
}
void CTickerCtrl::progress() {
	CRect rcScroll;
	GetClientRect( rcScroll );
	rcScroll.top += 2;
	rcScroll.left += 2;
	rcScroll.bottom -= 2;
	rcScroll.right -= 2;
	CDC* pDC = GetDC();
	if( --m_nOffset < -pDC->GetTextExtent( m_strText ).cx )
	    m_nOffset = 0;
	ReleaseDC( pDC );
	ScrollWindow( -1, 0, rcScroll, rcScroll );
}
BOOL CTickerCtrl::OnEraseBkgnd(CDC* pDC) {
	CRect rcClient;
	GetClientRect( rcClient );
	pDC->FillSolidRect( rcClient, GetSysColor( COLOR_WINDOW ) );
	return CWnd::OnEraseBkgnd(pDC);
}
int CTickerCtrl::OnCreate(LPCREATESTRUCT lpCreateStruct) {
	if (CWnd::OnCreate(lpCreateStruct) == -1)
		return -1;
	CDC* pDC = GetDC();
	CSize baseSize = pDC->GetTextExtent( "X" );
	SetWindowPos( NULL, 0, 0, baseSize.cx * 40, baseSize.cy + 4, SWP_NOMOVE | SWP_NOZORDER );
	ReleaseDC( pDC );
	return 0;
}
```

```
/* usage */
class CTickerDlg : public CDialog {
public:
        CTickerDlg(CWnd* pParent = NULL);
        enum { IDD = IDD_TICKER_DIALOG };
        virtual BOOL DestroyWindow();
private:
        CTickerCtrl* m_pTicker;
protected:
        virtual BOOL OnInitDialog();
        afx_msg void OnSize(UINT nType, int cx, int cy);
        DECLARE_MESSAGE_MAP()
};
CTickerDlg::CTickerDlg(CWnd* pParent /*=NULL*/) : CDialog( CTickerDlg::IDD, NULL), m_pTicker( NULL ) {}
BEGIN_MESSAGE_MAP(CTickerDlg, CDialog)
        ON_WM_SIZE()
END_MESSAGE_MAP()
BOOL CTickerDlg::OnInitDialog() {
        CRect rcClient, rcWnd, rcCtrl;
        CDialog::OnInitDialog();
        GetClientRect( rcClient );
        GetWindowRect( rcWnd );
        m_pTicker = new CTickerCtrl;
        m_pTicker->Create( NULL, NULL, WS_CHILD | WS_VISIBLE , rcClient, this, -1 );
        m_pTicker->GetClientRect( rcCtrl );
        SetWindowPos( NULL, 0, 0, rcCtrl.Width() + rcWnd.Width() - rcClient.Width(), rcCtrl.Height() + rcWnd.Height() - rcClient.Height(), SWP_NOMOVE |
SWP_NOZORDER );
        m_pTicker->SetText( "Qt increases productivity ++ ");
        return TRUE;
}
BOOL CTickerDlg::DestroyWindow() {
    delete m_pTicker;
        return CDialog::DestroyWindow();
}
void CTickerDlg::OnSize(UINT nType, int cx, int cy) {
        CRect rcClient;
        CDialog::OnSize(nType, cx, cy);
        GetClientRect( rcClient );
    if( m_pTicker )
            m_pTicker->SetWindowPos( NULL, 0, 0, rcClient.Width(), rcClient.Height(), SWP_NOMOVE | SWP_NOZORDER );
}
class CTickerApp : public CWinApp {
public:
        CTickerApp();
        public:
        virtual BOOL InitInstance();
        DECLARE_MESSAGE_MAP()
};
BEGIN_MESSAGE_MAP(CTickerApp, CWinApp)
END_MESSAGE_MAP()
CTickerApp::CTickerApp(){}
CTickerApp theApp;
BOOL CTickerApp::InitInstance() {
        Enable3dControls();
        CTickerDlg dlg;
        dlg.DoModal();
        return FALSE;
}
```

Summation

To build the widget shown, you must write:

With MOTIF: 224 loc
With MFC: 164 loc
With Qt: 61 loc

Put another way, Qt lets you write between 63 and 73 percent less code to do the same amount of work—*for a single platform*. (If there are any developers out there who think they have a better way to build this widget using MFC or MOTIF, we'd be happy to hear from you.)

But this takes no account of Qt's *multiplatform* capabilities. If you write a GUI using MFC or MOTIF—and you want it to run on Windows, Linux/Unix, Mac OS X, and embedded Linux—you have to write four source-trees. With Qt you write (and maintain) just one, and recompile it for each target.

To find out more, come visit us at www.trolltech.com. Look at our list of Fortune 500 customers. Read what developers say about us. Download an evaluation version of Qt. Find a new answer to the question: How much work do *you* want to do today?

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