

## Re: MD4 class in VB.NET

**Source:** <http://www.derkeiler.com/Newsgroups/microsoft.public.dotnet.security/2004-08/0004.html>

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**From:** Bismark Prods (*xanaia#nospam#\_at\_urbanet.ch*)

**Date:** 08/01/04

Date: Sun, 1 Aug 2004 17:33:27 +0200

in vb.net :

see attachment

Bismark

"Rob Teixeira [MVP]" <RobTeixeira@msn.com> a écrit dans le message de news:%23m4Y\$4cdEHA.4092@TK2MSFTNGP10.phx.gbl...

> *There is no native MD4 implementation in the .NET framework. I'm sure you  
> might be able to find some code on the internet you can use in .NET (or  
> convert to .NET) because I've seen some open source projects here and  
there*

> *that still use it.*

>

> *However, as a word of caution, this is from www.hack.gr*

>

> *"Attacks on versions of MD4 with either the first or the last rounds  
missing*

> *were developed very quickly by Den Boer and Bosselaers and others.*

Dobbertin

> *has shown how collisions for the full version of MD4 can be found in under  
a*

> *minute on a typical PC. Clearly, MD4 should now be considered broken."*

>

> *If you are using MD4 to interface with legacy data, that's one thing. But*

I

> *would not recommend using MD4 for new applications.*

>

> *-Rob Teixeira [MVP]*

>

> *"Chris Berrington" <ChrisBerrington@discussions.microsoft.com> wrote in*

> *message news:70ADF698-302F-406D-B83E-7C74083EA4F0@microsoft.com...*

>> *Hi,*

>>

>> *Does anyone know of a VB.NET class to compute MD4 Hashes? It seems only  
> MD5 was implemented?*

>>

>> *Cheers*

>>  
>> Chris  
>>  
>  
>

begin 666 MD4.vb

```
M)T-O<'ER:6=H=" H8RD@,C P,"!/<F5N($YO=F]T;GD@*&]S;D!P;RYC=W)U
M+F5D=2D-"B=097)M:7-S:6]N(&ES(&=R86YT960=@=&\@=-7-E('1H:7,@8VJD
M92!F;W(@86YY=&AI;F<N#0HG1&5R:79E9"!F<F]M('1H92!24T$@1&%T82!3
M96-U<FET>2P@26YC+B!-1#0@365S<V%G92U$:6=E<W0@06QG;W)I=&AM+B-
M"B=H='1P.B\O=W=W+G)S87-E8W5R:71Y+F-O;2(^4E-!($1A=&$@4V5C=7)I
M='DL($EN8RX\+V$^(')E<75I<F5S( T*)V%T=)I8G5T:6]N(&9O<B!A;GD@
M=V]R:R!T:&%T(&ES(&1E<FEV960@9G)O;2!T:&4@340T($UE<W-A9V4M1&EG
M97-T( T*)T%L9V]R:71H;3L@9F]R(&1E=&%I;,@<V5E(#QA(&AR968](FAT
M=' Z+R]W=W<N<F]X96XN8V]M+W)F8R]R9F,Q,S(P+FAT;6PB/@T*)U)&0R Q
M,S(P"/]A/BX-"B=4:&ES(&-O9&4@:7,@&]R=&5D(&9R;VT@3F]R8F5R="!(
M<F%N:71Z:WDG<R-"B<H;F]R8F5R="YH<F%N:71Z:WE ;6-H<"YS:65M96YS
M+F1E*0T*)TIA=F$@=F5R<VEO;BX-"@T*26UP;W)T<R!3>7-T96T-"DEM<&]R
M=',@4WES=&5M+E1E>'0-"@T*3F%M97-P86-E($US-$AA<V@-"@T*(" @("=)
M;7!L96UE;G1S('1H92!-1#0@;65S<V%G92!D:6=E<W0@86QG;W)I=&AM(&EN
M(%9"+DYE= T*(" @#0H@(" @)R!2;VYA;&0@3"X@4FEV97-T+ T*(" @("<@
M:'1T<#HO+W=W=RYS;WAE;BYC;VTO<F9C+W)F8SS$,C N:'1M; T*(" @("<@
M5&AE($US-"!-97-S86=E+41I9V5S="!!;&=O<FET:&T-"B @(" G($E%5$8@
M4D9#++3$$,C @*&EN9F]R;6%T:6]N86PI+@T*(" @(" T*(" @(%!U8FQI8R!#
M;&%S<R!-1#0-"@T*(U)E9VEO;B B340T('-P96-I9FEC(&]B:F5C="!V87)I
M86]L97,B#0H-"B @(" @(" @)R!4;&4@<VEZ92!;B!B>71E<R!O9B!T:&4@
M:6YP=70@8FQO8VL@=&\@=-&AE('1R86YS9F]R;6%T:6]N(&%L9V]R:71H;0T*
M(" @(" @("!0<FEV871E($-O;G-T($),3T-+7TQ%3D=42"!!<R!);G1E9V5R
M(#T@-C0@(" @)R ](#4Q,B O(#@-"B @(" @(" @)R T(#,R+6)I="!W;W)D
M<R H:6YT97)I;2!R97-U;'0I#0H@(" @(" @(%!R:79A=&4@8V]N=&5X="@T
M*2!!<R!);G0V- T*(" @(" @(" G($YU;6)E<B!O9B!B>71E<R!P<F]C97-E
M9"!S;R!F87(@;6]D+B R('!O=V5R(&]F(#8T+@T*(" @(" @("!0<FEV871E
M(&-O=6YT($%S($EN=&5G97("-B @(" @(" @)R U,3(M8FET(&EN<'5T(&)U
M9F9E<B ](#$V('@@,S(M8FET('=O<F1S(&AO;&1S('5N=&EL(&ET(')E86-H
M97,@-3$R(&)I='-"B @(" @(" @4)I=F%T92!B=69F97(H0DQ/0TM?3$5.
M1U1(*2!!<R!)">71E#0H@(" @(" @(" @("<-3$R+6)I="!W;W)K(&)U9F9E<B ]
M(#$V('@@,S(M8FET('=O<F1S#0H@(" @(" @(%!R:79A=&4@6"@Q-BD@07,@
M26YT-C0-"B-%;F0@4F5G:6]N#0H-"B-296=I;VX@(D-O;G-T<G5C=&]R<R(-
M"B @(" @(" @45B;&EC(%-U8B!.97<H*0T*(" @(" @(" @(" @96YG:6YE
M4F5S970H*0T*(" @(" @("!%;F0@4W5B#0H-"B @(" @(" @)R!4:&ES(&-O
M;G-T<G5C=&]R(&ES(&AE<F4@=&\@:6UP;&5M96YT('1H92!C;&]N86)I;&ET
M>2!O9B!T:&ES(&-L87-S#0H@(" @(" @(%!R:79A=&4@4W5B($YE=RA">59A
M;"!M9"!<R!-1#0I#0H@(" @(" @(" @("!C;VYT97AT(#T@0U1Y<&4H;60N
M8V]N=&5X="Y#;&]N92@I+!");G0V-"@I*0T*(" @(" @(" @(" @8G5F9F5R
M(#T@0U1Y<&4H;60N8G5F9F5R+D-L;VYE*"DL($)Y=&4H*2D-"B @(" @(" @
M(" @(&-O=6YT(#T@;60N8V]U;G0-"B @(" @(" @16YD(%-U8@T*(T5N9"!2
M96=I;VX-"@T*(U)E9VEO;B B0VQO;F%B;&4@;65T:&]D(&EM<&QE;65N=&%T
M:6]N(@T*(" @(" @("!0=6)L:6,@1G5N8W1I;VX@0VQO;F4H*2!!<R!/8FIE
M8W0-"B @(" @(" @(" @(%E=5R;B!.97<@340T*$UE*0T*(" @(" @("!%
M;F0@1G5N8W1I;VX-"B-%;F0@4F5G:6]N#0H-"B-296=I;VX@(DI#12!M971H
```

M;V1S(@T\*#0H@(" @(" @("<@4F5S971S('1H:7,@;V)J96-T(&1I<W)E9V%R  
M9&EN9R!A;GD@=&5M<&]R87)Y(&1A=&\$@<')E<V5N="!A="!T:&4-"B @(" @  
M(" @)R!T:6UE(&]F('1H92!I;G9O8V%T:6]N(&]F('1H:7,@8V%L;"X-"B @  
M(" @(" @4)I=F%T92!3=6(@96YG:6YE4F5S970H\*0T\*(" @(" @(" @(" @  
M)R!I;FET:6%L('9A;'5E<R!O9B!-1#0@:2YE+B!!+"!#"!\$#0H@(" @  
M(" @(" @(" G(&%S('!E<B!R9F,M,3,R,#L@=&AE>2!A<F4@;&]W+6]R9&5R  
M(&)Y=&4@9FER<W0-"B @(" @(" @(" @(&-O;G1E>'0H,"D@/2 F2#8W-#4R  
M,S Q#0H@(" @(" @(" @(" !C;VYT97AT\*#I(#T@)DA%1D-\$04(X.0T\*(" @  
M(" @(" @(" @8V]N=&5X="R\*2 ]("9(.3A"041#1D4-"B @(" @(" @(" @  
M(&-O;G1E>'0H,RD@/2 F2#SP,S(U-#<V#0H@(" @(" @(" @(" !C;W5N=" ]  
M(#-"B @(" @(" @(" @(\$1I;2!I(\$%S(\$EN=&5G97(@/2 P#0H@(" @(" @  
M(" @(" !;\$R!5;G1I;"!I(#P@0DQ/0TM?3\$5.1U1(#0H@(" @(" @(" @(" @  
M(" @8G5F9F5R\*&DI(#T@, T\*#0H@(" @(" @(" @(" @(" @:2 K/2 Q#0H@  
M(" @(" @(" @(" !;V]P#0H@(" @(" @(\$5N9"!3=6(-@T\*(" @(" @(" G  
M(\$-O;G1I;G5E<R!A;B!-1#0@;65S<V%G92!D:6=E<W0@=7-I;F<@=&AE(&EN  
M<5T(&)Y=&4-"B @(" @(" @)R @(&)Y=&4@=&\@:6YP=70-"B @(" @(" @  
M4)I=F%T92!3=6(@96YG:6YE57!D871E\*\$)Y5F%L(&(@07,@0GET92D-"B @  
M(" @(" @(" @("<@8V]M<'5T92!N=6UB97(@;V8@8GET97,@<W1I;&P@=6YH  
M87-H960[(&EE+B!P<F5S96YT(&EN(&)U9F9E<@T\*(" @(" @(" @(" @1&EM  
M(&D@07,@26YT96=E<B ](\$-4>7!E\*&-O=6YT(\$UO9!"!3\$]#2U],14Y'5\$@L  
M(\$EN=&5G97(I#0H@(" @(" @(" @(" !C;W5N=" K/2 Q("<@=7!D871E(&YU  
M;6)E<B!O9B!B>71E<PT\*(" @(" @(" @(" @8G5F9F5R\*&DI(#T@8@T\*(" @  
M(" @(" @(" @268@:2 ]("A"3\$]#2U],14Y'5\$@ @+2 Q\*2!4:&5N#0H@(" @  
M(" @(" @(" @(" @=)A;G-F;W)M\*&)U9F9E<BP@,"D-"B @(" @(" @(" @  
M(\$5N9"!9@T\*(" @(" @(" !%;F0@4W5B#0H-"B @(" @(" @)R!-1#0@8FQO  
M8VL@=7!D871E(&]P97)A=&EO;@T\*(" @(" @(" G(\$-O;G1I;G5E<R!A;B!-  
M1#0@;65S<V%G92!D:6=E<W0@;W!E<F%T:6]N(&)Y(&9I;&QI;F<@=&AE(&)U  
M9F9E<BP@#0H@(" @(" @(" @(" @=)A;G-F;W)M\*&EN9RD@9&%T82!I;B U,3(M  
M8FET(&UE<W-A9V4@8FQO8VLH<RDL('5P9&%T:6YG('1H92!V87)I86)L97,-  
M"B @(" @(" @)R!C;VYT97AT(&%N9"!C;W5N="P@86YD(&QE879I;F<@\*&)U  
M9F9E<FEN9RD@=&AE(')E;6%I;FEN9R!B>71E<R!;B!B=69F97(-"B @(" @  
M(" @)R!F;W(@=&AE(&YE>'0@=7!D871E(&]R(&9I;FES:"X-"B @(" @(" @  
M)R @(&EN<'5T" ](&EN<'5T(&)L;V-K#0H@(" @(" @(" @(" @(" !O9F9S970@  
M/2!S=&%R="!O9B!M96%N:6YG9G5L(&)Y=&5S(&EN(&EN<'5T#0H@(" @(" @  
M("<@(" !L96X@(" @/2!C;W5N="!O9B!B>71E<R!;B!;G!U="!B;&-O:R!T  
M;R!C;VYS:61E<@T\*(" @(" @(" !0<FEV871E(%-U8B!E;F=I;F55<&1A=&4H  
M0GE686P@:6YP=70H\*2!!<R!">71E+"!>59A;"!O9F9S970@07,@26YT96=E  
M<BP@0GE686P@;&5N(\$%S(\$EN=&5G97(I#0H@(" @(" @(" @(" G(&UA:V4@  
M<W5R92!W92!D;VXG="!E>&-E960@:6YP=70G<R!A;&QO8V%T960@<VEZ92]L  
M96YG=&@-"B @(" @(" @(" @(\$EF("AO9F9S970@/" P(\$]R(&QE;B \(# @  
M3W(@0U1Y<&4H;V9F<V5T+"!);G1E9V5R\*2 K(&QE;B ^(&EN<'5T+DQE;F=T  
M:"D@5&AE;@T\*(" @(" @(" @(" @(" @(" @%1H<F]W(\$YE=R!!<F=U;65N=\$]U  
M=\$]F4F%N9V5%>&-E<'1I;VXH\*0T\*(" @(" @(" @(" @(" @16YD(\$EF#0H@(" @  
M(" @(" @(" G(&-O;7!U=&4@;G5M8F5R(&]F(&)Y=&5S('T:6QL('5N:&%S  
M:&5D.R!I92X@<')E<V5N="!;B!B=69F97(-"B @(" @(" @(" @(\$1I;2!B  
M=69F97).9'@07,@26YT96=E<B ](\$-4>7!E\*&-O=6YT(\$UO9!"!3\$]#2U],  
M14Y'5\$@L(\$EN=&5G97(I#0H@(" @(" @(" @(" !C;W5N=" K/2!L96X@("<  
M=7!D871E(&YU;6)E<B!O9B!B>71E<PT\*(" @(" @(" @(" @1&EM(!A<G1,  
M96X@07,@26YT96=E<B ](\$),3T-+7TQ%3D=42" M(&)U9F9E<DYD> T\*(" @  
M(" @(" @(" @1&EM(&D@07,@26YT96=E<B ](#-"B @(" @(" @(" @(\$EF  
M(&QE;B ^/2!P87)T3&5N(%1H96X-"B @(" @(" @(" @(" @(" !<G)A>2Y#



M(&)Y=&4M87)R87D@=&AA="!C;VYT86EN<R!T:&4@:&%S: T\*(" @(" @(" !0  
M=6)JL:6,@1G5N8W1I;VX@1V5T0GET94AA<VA&<F]M4W1R:6YG\*\$)Y5F%L(,@  
M07,@4W1R:6YG\*2!!<R!">71E\*"D-"B @(" @(" @(" @(\$!1;2!B\*"D@07,@  
M0GET92 ](\$5N8V]D:6YG+E541C@N1V5T0GET97,H<RD-"B @(" @(" @(" @  
M(\$!1;2!?:60T(\$%S(\$US\$-" ](\$YE=R!-1#0H\*0T\*#0H@(" @(" @(" @(" !?  
M;60T+F5N9VEN955P9&%T92AB+" P+"!B+DQE;F=T:"D-"@T\*(" @(" @(" @  
M(" @4F5T=7)N(%]M9#0N96YG:6YE1&EG97-T\*"D-"B @(" @(" @16YD(\$9U  
M;F-T:6]N#0H-"B @(" @(" @)R!2971U<FYS(&\$@8FEN87)Y(&AA<V@@9G)O  
M;2!A;B!I;G!U="!B>71E(&%R<F%Y#0H@(" @(" @(" <@(" !B(#T@8GET92UA  
M<G)A>2!T;R!H87-H#0H@(" @(" @(" <@(" !R971U<FYS(&)I;F%R>2!H87-H  
M(&]F(&EN<5T#0H@(" @(" @(" !U8FQI8R!&=6YC=&EO;B!971">71E2&%S  
M:\$9R;VU">71E<RA">59A;"!B\*"D@07,@0GET92D@07,@0GET92@I#0H@(" @  
M(" @(" @(" !\$:6T@7VUD-"!!<R!-1#0@/2!97<@340T\*"D-"@T\*(" @(" @  
M(" @(" @7VUD-"YE;F=I;F55<&1A=&4H8BP@,"P@8BY,96YG=&@I#0H-"B @  
M(" @(" @(" @(%E='5R;B!?:60T+F5N9VEN941I9V5S="!#0H@(" @(" @  
M(\$5N9"!&=6YC=&EO;@T\*#0H@(" @(" @(" <@4F5T=7)N<R!A('T<FEN9R!T  
M:&%T(&-O;G1A:6YS('1H92!H97AA9&5C:6UA;"!H87-H#0H@(" @(" @(" <@  
M(" !B(#T@8GET92UA<G)A>2!T;R!;G!U= T\*(" @(" @(" G(" @<F5T=7)N  
M<R!3=)I;F<@=&AA="!C;VYT86EN<R!T:&4@:&5X(&]F('1H92!H87-H#0H@  
M(" @(" @(" !U8FQI8R!&=6YC=&EO;B!971(97A(87-H1G)O;4)Y=&5S\*\$)Y  
M5F%L(&(H\*2!!<R!">71E\*2!!<R!3=)I;F<- "B @(" @(" @(" @(\$!1;2!E  
M\*"D@07,@0GET92 ](\$=E=\$)Y=&5(87-H1G)O;4)Y=&5S\*&(I#0H@(" @(" @  
M(" @(" !2971U<FX@8GET97-4;TAE>"AE+"!E+DQE;F=T:"D-"B @(" @(" @  
M16YD(\$9U;F-T:6]N#0H-"B @(" @(" @)R!2971U<FYS(&\$@8GET92!H87-H  
M(&9R;VT@=&AE(&EN<5T(&)Y=&4-"B @(" @(" @)R @(&(@/2!B>71E('1O  
M(&AA<V@-"B @(" @(" @)R @(')E='5R;G,@8FEN87)Y(&AA<V@@;V8@=&AE  
M(&EN<5T(&)Y=&4-"B @(" @(" @4'5B;&EC(\$9U;F-T:6]N(\$=E=\$)Y=&5(  
M87-H1G)O;4)Y=&4H0GE686P@8B!!<R!">71E\*2!!<R!">71E\*"D-"B @(" @  
M(" @(" @(\$!1;2!?:60T(\$%S(\$US\$-" ](\$YE=R!-1#0H\*0T\*#0H@(" @(" @  
M(" @(" !?:60T+F5N9VEN955P9&%T92AB\*0T\*#0H@(" @(" @(" @(" !2971U  
M<FX@7VUD-"YE;F=I;F5\$:6=E<W0H\*0T\*(" @(" @(" !%;F0@1G5N8W1I;VX-  
M"@T\*(" @(" @(" G(%E='5R;G,@82!S=)I;F<@=&AA="!C;VYT86EN<R!T  
M:&4@:&5X861E8VEM86P@:&%S: T\*(" @(" @(" G(" @8B ](&)Y=&4@=&\@  
M:&%S: T\*(" @(" @(" G(" @<F5T=7)N<R!3=)I;F<@=&AA="!C;VYT86EN  
M<R!T:&4@:&5X(&]F('1H92!H87-H#0H@(" @(" @(" !U8FQI8R!&=6YC=&EO  
M;B!971(97A(87-H1G)O;4)Y=&4H0GE686P@8B!!<R!">71E\*2!!<R!3=)I  
M;F<- "B @(" @(" @(" @(\$!1;2!E\*"D@07,@0GET92 ](\$=E=\$)Y=&5(87-H  
M1G)O;4)Y=&4H8BD-"B @(" @(" @(" @(%E='5R;B!B>71E<U1O2&5X\*&4L  
M(&4N3&5N9W1H\*0T\*(" @(" @(" !%;F0@1G5N8W1I;VX-"@T\*(" @(" @(" G  
M(%E='5R;G,@82!S=)I;F<@=&AA="!C;VYT86EN<R!T:&4@:&5X861E8VEM  
M86P@:&%S: T\*(" @(" @(" G(" @<R ]('T<FEN9R!T;R!H87-H#0H@(" @  
M(" @(" <@(" !R971U<FYS(%-T<FEN9R!T:&%T(&-O;G1A:6YS('1H92!H97@  
M;V8@=&AE(&AA<V@-"B @(" @(" @4'5B;&EC(\$9U;F-T:6]N(\$=E=\$AE>\$AA  
M<VA&<F]M4W1R:6YG\*\$)Y5F%L(,@07,@4W1R:6YG\*2!!<R!3=)I;F<- "B @  
M(" @(" @(" @(\$!1;2!B\*"D@07,@0GET92 ](\$=E=\$)Y=&5(87-H1G)O;5-T  
M<FEN9RAS\*0T\*(" @(" @(" @(" @4F5T=7)N(&)Y=&5S5&](97@H8BP@8BY,  
M96YG=&@I#0H@(" @(" @(\$5N9"!&=6YC=&EO;@T\*#0H@(" @(" @(" !R:79A  
M=&4@4VAA<F5D(\$9U;F-T:6]N(&)Y=&5S5&](97@H0GE686P@82@I(\$%S(\$)Y  
M=&4L(\$)Y5F%L(&QE;B!!<R!);G1E9V5R\*2!!<R!3=)I;F<- "B @(" @(" @  
M(" @(\$!1;2!T96UP(\$%S(%-T<FEN9R ](\$I=\$-O;G9E<G1E<BY4;U-T<FEN  
M9RAA\*0T\*(" @(" @(" @(" @1&EM(&D@07,@26YT96=E<@T\*(" @(" @(" @

M(" @)R!792!N965D('1O(')E;6jV92!T:&4@9&%S:&5S('1H870@8V]M92!F  
M<F]M('1H92!":71#;VYV97)T97(-"B @(" @(" @(" @(\$!1;2!S8B!!<R!3  
M=)I;F="=6EL9&5R(#T@3F5W(%-T<FEN9T)U:6QD97(H0U1Y<&4H\*&QE;B M  
M(#(I("@\_BP@26YT96=E<BDI("<@5&AI<R!S:&JU;&0@8F4@=&AE(&9I;F%L  
M('I>F4-"@T\*(" @(" @(" @(" @1F]R(&D@/2 P(%1O('1E;7 N3&5N9W1H  
M("T@,2!3=&5P(#\$-"B @(" @(" @(" @(" @("!)9B!T96UP+E-U8G-T<FEN  
M9RAI+" Q\*2 \B B+2(@5&AE;@T\*(" @(" @(" @(" @(" @(" @("!)S8BY!  
M<!E;F0H=&5M<"Y3=6)S=)I;F<H:2P@,2DI#0H@(" @(" @(" @(" @(" @  
M16YD(\$EF#0H@(" @(" @(" @("!)97AT#0H@(" @(" @(" @("!)2971U<FX@  
M<V(N5&j3=)I;F<H\*0T\*(" @(" @("!)%;F0@1G5N8W1I;VX-"B-%;F0@4F5G  
M:6]N#0H-"B-296=I;VX@(F]W;B!M971H;V1S(@T\*#0H@(" @(" @(" @(<340T  
M(&)A<VEC('1R86YS9F]R;6%T:6]N#0H@(" @(" @(" @(<@5)A;G-F;W)M<R!C  
M;VYT97AT(&)A<V5D(&]N(#4Q,B!B:71S(&9R;VT@:6YP=70@8FQO8VL@<W1A  
M<G1I;F<-"B @(" @(" @)R!F<F]M('1H92!O9F9S970G=&@@@8GET92X-"B @  
M(" @(" @)R @(&)L;V-K(")(&EN<5T(-U8BUA<G)A>0T\*(" @(" @(" G  
M(" @;V9F<V5T(#T@<W1A<G1I;F<@<&]S:71I;VX@;V8@<W5B+6%R<F%Y#0H@  
M(" @(" @(%!R:79A=&4@4W5B('1R86YS9F]R;2A">5)E9B!B;&]C:R@I(%S  
M(\$)Y=&4L(\$)Y5F%L(&]F9G-E="!!<R!);G1E9V5R\*0T\*(" @(" @(" @(" @  
M)R!D96-O9&5S(#8T(&)Y=&5S(&9R;VT@:6YP=70@8FQO8VL@:6YT;R!A;B!A  
M<G)A>2!O9B Q-B S,BUB:70-"B @(" @(" @(" @(" @(<96YT:71I97,N(%5S  
M92!(%&S(&\$@=&5M<"!V87(N#0H@(" @(" @(" @("!)\$:6T@:2!!<R!);G1E  
M9V5R#0H@(" @(" @(" @("!)&W(@:2 ](# @5&\@,34@4W1E<" Q#0H@(" @  
M(" @(" @(" @(" @268@;V9F<V5T(#X](&)L;V-K+DQE;F=T:"!4:&5N(\$5X  
M:70@1F]R#0H@(" @(" @(" @(" @(" @6"AI\*2 ]("A#5'EP92AB;&]C:RAO  
M9F9S970I+!");G0V-"D@06YD("9(1D8I(\$]R(%-"B @(" @(" @(" @(" @  
M("A#5'EP92AB;&]C:RAO9F9S970I+!");G0V-"D@06YD("9(1D8I(#P]#@@  
M3W(@7PT\*(" @(" @(" @(" @(" H0U1Y<&4H8FQO8VLH;V9F<V5T\*2P@26YT  
M-C0I(\$%N9" F2\$9&\*2 \/" Q-B!/<B!/?#0H@(" @(" @(" @(" @("A#5'EP  
M92AB;&]C:RAO9F9S970I+!");G0V-"D@06YD("9(1D8I(#P]#(T#0H@(" @  
M(" @(" @(" @(" @;V9F<V5T("L](\$\$-"B @(" @(" @(" @(\$YE>0-"@T\*  
M(" @(" @(" @(" @1&EM(\$\$@07,@26YT-C0@/2!C;VYT97AT\*# I#0H@(" @  
M(" @(" @("!)\$:6T@0B!!<R!);G0V-" ](&-O;G1E>0H,2D-"B @(" @(" @  
M(" @(\$!1;2!#(\$%S(\$EN=#8T(#T@8V]N=&5X="@R\*0T\*(" @(" @(" @(" @  
M1&EM(\$0@07,@26YT-C0@/2!C;VYT97AT\*#,I#0H-"B @(" @(" @(" @(\$\$@  
M/2!&1BA!+"!+"!#+"!\$+"!8\*# I+" S\*0T\*(" @(" @(" @(" @1" ](\$9&  
M\*\$0L(\$L(\$L(\$L(%@H,2DL(#<1#0H@(" @(" @(" @("!)#(#T@1D8H0RP@  
M1"P@02P@0BP@6"@R\*2P@,3\$I#0H@(" @(" @(" @("!)#(T@1D8H0BP@0RP@  
M1"P@02P@6"@S\*2P@,3DI#0H@(" @(" @(" @("!)#(T@1D8H02P@0BP@0RP@  
M1"P@6"@T\*2P@,RD-"B @(" @(" @(" @(\$0@/2!&1BA\$+"!+"!+"!#+"!8  
M\*#4I+" W\*0T\*(" @(" @(" @(" @0R ](\$9&\*\$,L(\$0L(\$L(\$L(%@H-BDL  
M(#\$Q\*0T\*(" @(" @(" @(" @0B ](\$9&\*\$,L(\$L(\$0L(\$L(%@H-RDL(#\$Y  
M\*0T\*(" @(" @(" @(" @02 ](\$9&\*\$,L(\$L(\$L(\$L(%@H."DL(#,I#0H@  
M(" @(" @(" @("!)\$(#T@1D8H1"P@02P@0BP@0RP@6"@Y\*2P@-RD-"B @(" @  
M(" @(" @(\$,@/2!&1BA#+"!\$+"!+"!+"!8\*#P\*2P@,3\$I#0H@(" @(" @  
M(" @("!)#(T@1D8H0BP@0RP@1"P@02P@6"@Q,2DL(#\$Y\*0T\*(" @(" @(" @  
M(" @02 ](\$9&\*\$,L(\$L(\$L(\$L(%@H,3(I+" S\*0T\*(" @(" @(" @(" @  
M1" ](\$9&\*\$,L(\$L(\$L(\$L(%@H,3,I+" W\*0T\*(" @(" @(" @(" @0R ]  
M(\$9&\*\$,L(\$0L(\$L(\$L(%@H,30I+" Q,2D-"B @(" @(" @(" @(\$@/2!&  
M1BA!+"!#+"!\$+"!+"!8\*#U\*2P@,3DI#0H-"B @(" @(" @(" @(\$\$@/2!  
M1RA!+"!+"!#+"!\$+"!8\*# I+" S\*0T\*(" @(" @(" @(" @1" ](\$=\*\$0L  
M(\$L(\$L(\$L(%@H-"DL(#4I#0H@(" @(" @(" @("!)#(#T@1T<H0RP@1"P@



M(\$%S(\$EN=#8T+"!">59A;"!B(\$%S(\$EN=#8T+"!">59A;"!C(\$%S(\$EN=#8T  
M+"!">59A;"!D(\$%S(\$EN=#8T+"!">59A;"!X(\$%S(\$EN=#8T+"!">59A;"!S  
M(\$%S(\$EN=&5G97(I(\$%S(\$EN=#8T#0H@(" @(" @(" @("!\$:6T@="!!<R!)  
M;G0V- T\*(" @(" @(" @(" @5')Y#0H@(" @(" @(" @(" @(" @=" ](&\$@  
M\*R H8B!>(&,@7B!D\*2 K('@@\*R F2#9%1#E%0D\$Q#0H@(" @(" @(" @(" @  
M(" @4F5T=7)N(0@/#P@<R!/<B!T(#X^("@S,B M(',I#0H@(" @(" @(" @  
M("!#871C: T\*(" @(" @(" @(" @(" @(%E='5R;B!T(#P(',@3W(@=" ^  
M/B H,S(@+2!S\*0T\*(" @(" @(" @(" @16YD(%1R>0T\*(" @(" @("!%;F0@  
M1G5N8W1I;VX-"B-%;F0@4F5G:6]N#0H-"B @("!%;F0@0VQA<W,-"D5N9"!.  
\*86UE<W!A8V4-"@``  
,  
end