REWRITING WITHOUT REWRITING

CHANGING THE WINGS AND ENGINE ON YOUR APPLICATION IN MID-FLIGHT

Jim Hague

jim.hague@acm.org @banbury_bill

LAIC Ag

ACCU Conference 2016

REWRITING WITHOUT REWRITING

CHANGING THE WINGS AND ENGINE ON YOUR APPLICATION IN MID-FLIGHT

Jim Hague

jim.hague@acm.org @banbury_bill

ACCU Conference 2016

REWRITING WITHOUT REWRITING

CHANGING THE WINGS AND ENGINE ON YOUR APPLICATION IN MID-FLIGHT

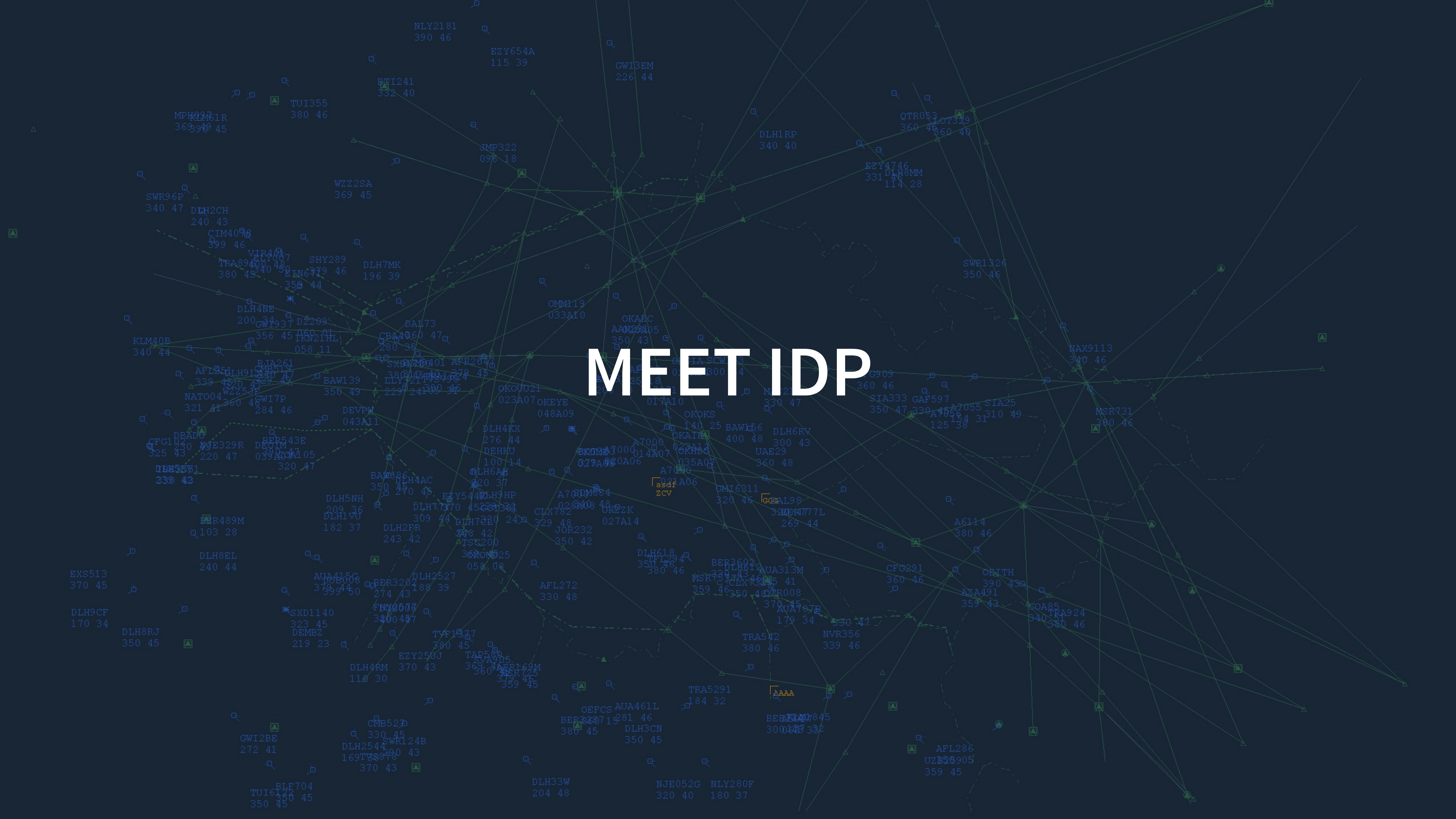
Jim Hague

jim.hague@acm.org @banbury_bill

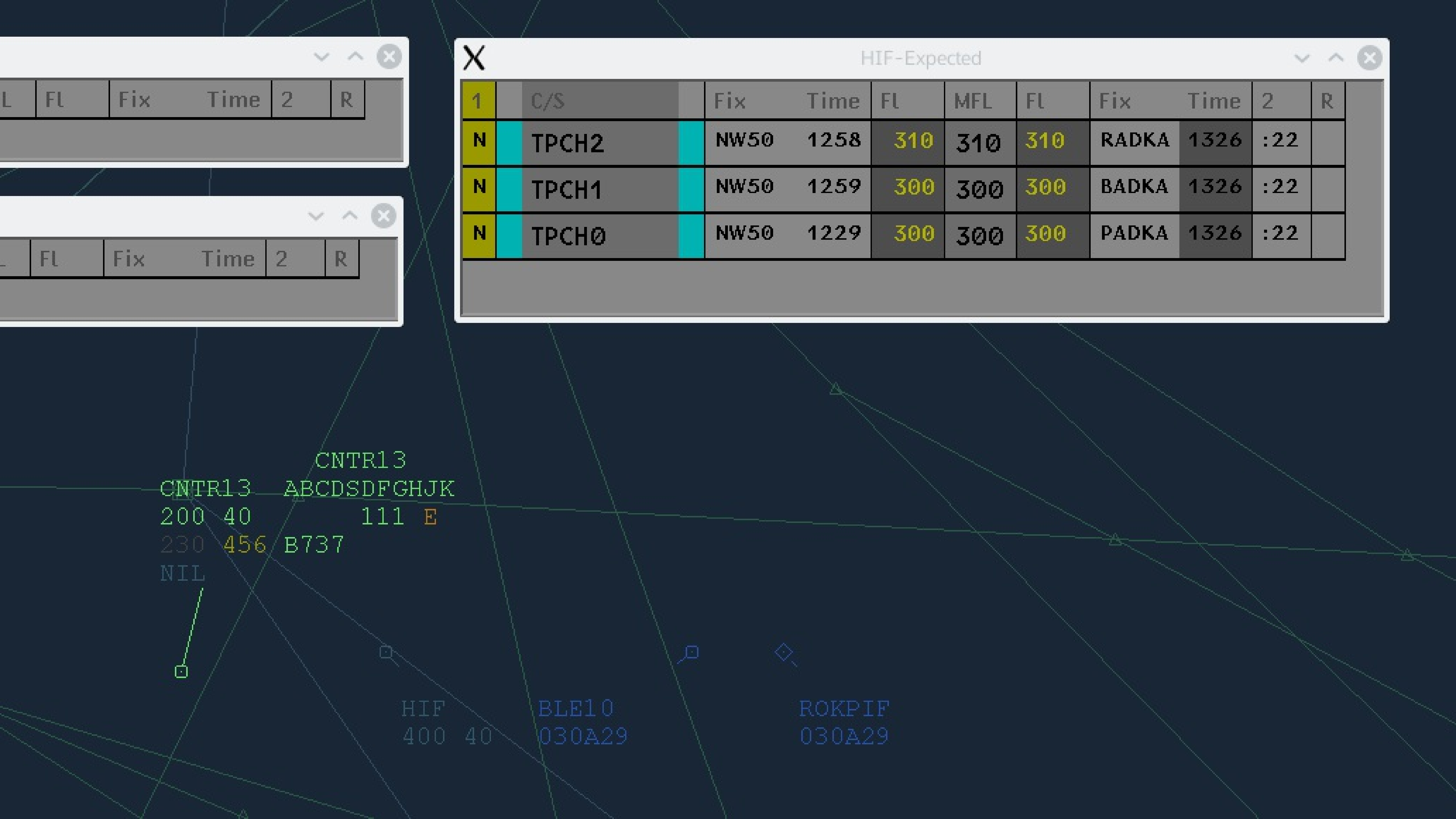
Sinodun Internet Technologies

ACCU Conference 2016

MEET IDP



NLY2181 390 46
EZY654A 115 39
GWI3EM 226 44
BTI241 332 40
TUI355 380 46
KLM61R 390 45
JMP322 096 18
DLH1RP 340 40
QTR053 360 40
LOT329 360 40
EZY4746 331
DLH8MM 114 28
WZZ2SA 369 45
SWR96P 340 47
DLH2CH 240 43
CIM4078 339 46
SHY289 379 46
DLH7MK 196 39
TRA89 380 45
SWR1326 350 46
OMM119 033A10
DLH4NE 200 34
DAL73 360 47
OKABC
KLM40B 340 44
NAX9113 340 46
CFG909 360 46
OKCIA 029A14
SCW733 300 44
TAP530
BAW139 350 49
OKOOU21 023A07
OKEYE 048A09
A7071 017A10
MAS21 330 47
SIA333 350 47
GAF597
A7055
SIA25 310 49
MSR731 380 46
NATO04 321 41
GWI7P 284 46
DEVPW 043A11
DLH4KX 276 44
OKOKS 140 25
BAW156 400 48
DLH6RV 300 43
A7000 014A07
UAE29 360 48
CFG102 325 43
NJE329R 220 47
BER543E
DEHKU 100 14
DLH6AH 220 37
A7000 021A06
GMI6311 320 46
DLH5NH 209 36
DLH4AC 270 45
DLH9HP
CLX782 329 48
OKEZK 027A14
A6114 380 46
DLH1VU 182 37
DLH2PR 243 42
JOR232 350 42
BER489M 103 28
DLH8EL 240 44
TSC200
DLH618
CFG291 360 46
OBITH 390 43
EXS513 370 45
AUA415G
DLH2527 188 39
AFL272 330 48
BER3602
AUA313M
MSR75 359 46
AZA491 359 43
DLH9CF 170 34
SXD1140 323 45
DEMBZ 219 23
TVF1377 380 45
TRA542 380 46
NVR356 339 46
AUA707B 179 34
COA85
TRA924 380 46
DLH8RJ 350 45
EZY250J 370 43
TAP530
DLH4RM 110 30
TRA5291 184 32
AAAA
OEFCS
AUA461L 281 46
DLH3CN 350 45
GWI2BE 272 41
CMB527
SWR124B
DLH2544
AFL286
DLH33W 204 48
NJE052G 320 40
NLY280F 180 37
BLF704
TUI612 350 45
asdf
ZCV
GGG



L	FL	Fix	Time	2	R

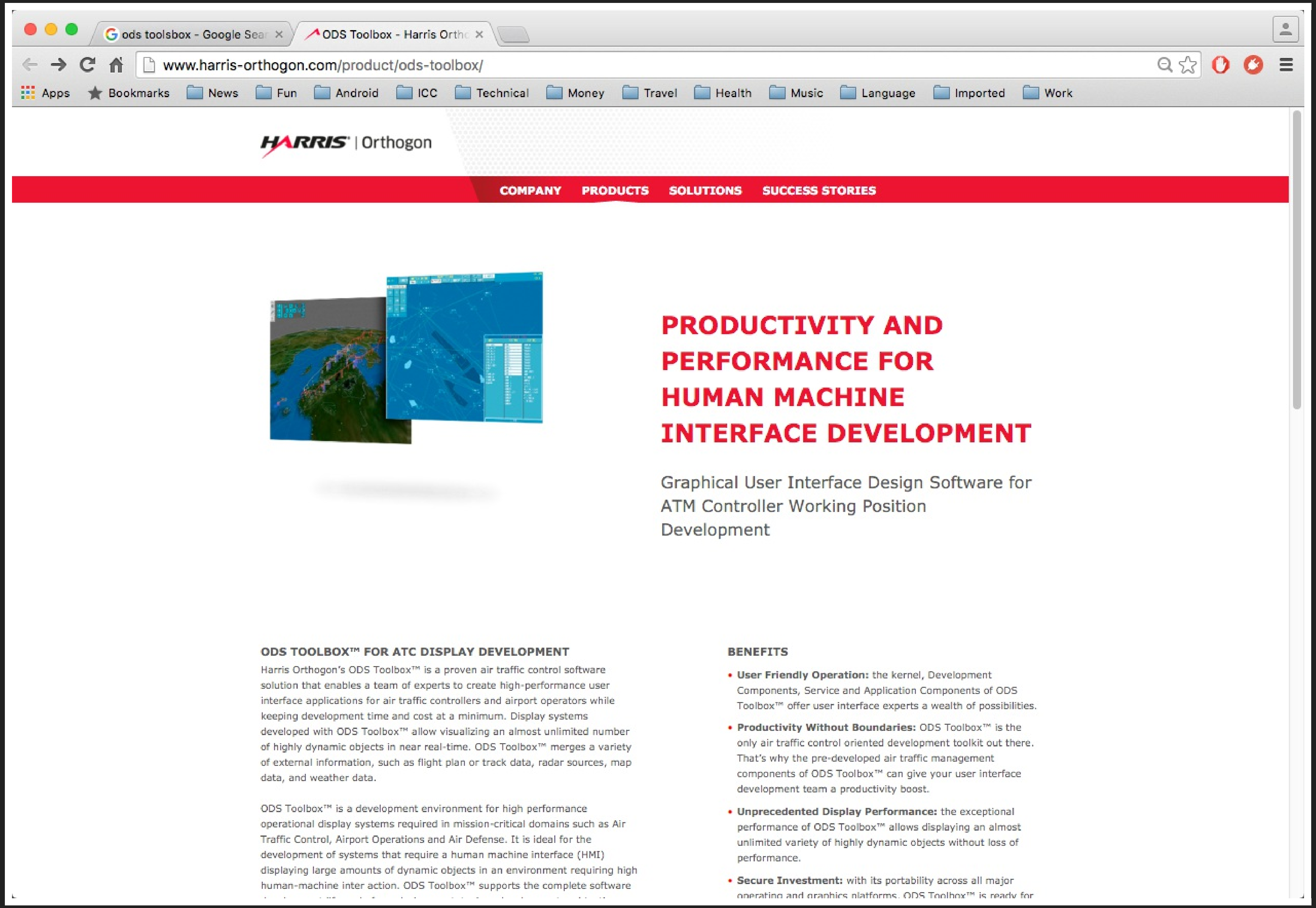
L	FL	Fix	Time	2	R

X HIF-Expected

1		C/S		Fix	Time	FL	MFL	FL	Fix	Time	2	R
N		TPCH2		NW50	1258	310	310	310	RADKA	1326	:22	
N		TPCH1		NW50	1259	300	300	300	BADKA	1326	:22	
N		TPCH0		NW50	1229	300	300	300	PADKA	1326	:22	

```
                CNTR13
CNTR13    ABCDSDFGHJK
200  40          111  E
230  456  B737
NIL
```

```
HIF         BLE10          ROKPIF
400  40     030A29         030A29
```



PRODUCTIVITY AND PERFORMANCE FOR HUMAN MACHINE INTERFACE DEVELOPMENT

Graphical User Interface Design Software for ATM Controller Working Position Development

ODS TOOLBOX™ FOR ATC DISPLAY DEVELOPMENT

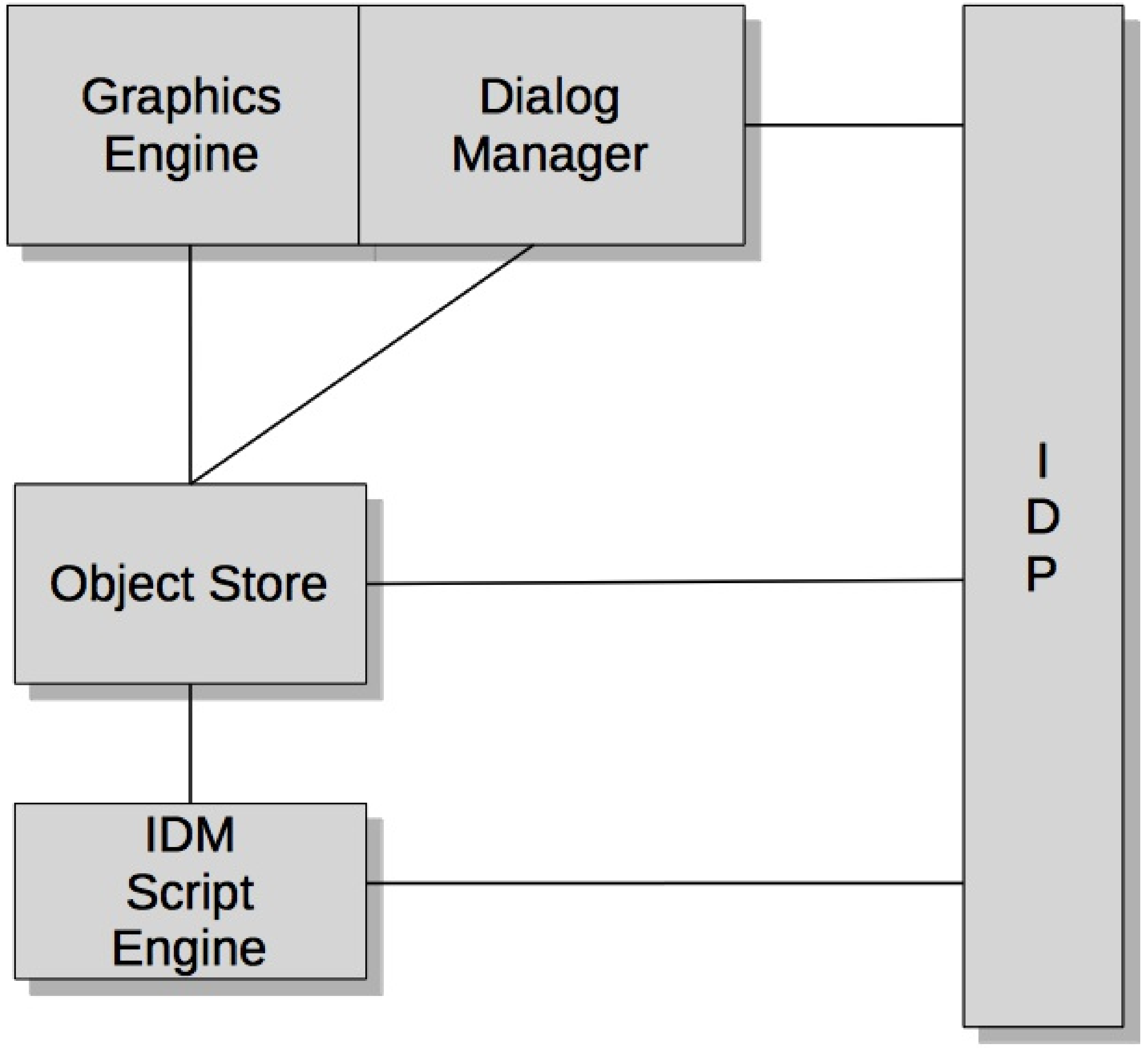
Harris Orthogon's ODS Toolbox™ is a proven air traffic control software solution that enables a team of experts to create high-performance user interface applications for air traffic controllers and airport operators while keeping development time and cost at a minimum. Display systems developed with ODS Toolbox™ allow visualizing an almost unlimited number of highly dynamic objects in near real-time. ODS Toolbox™ merges a variety of external information, such as flight plan or track data, radar sources, map data, and weather data.

ODS Toolbox™ is a development environment for high performance operational display systems required in mission-critical domains such as Air Traffic Control, Airport Operations and Air Defense. It is ideal for the development of systems that require a human machine interface (HMI) displaying large amounts of dynamic objects in an environment requiring high human-machine inter action. ODS Toolbox™ supports the complete software

BENEFITS

- **User Friendly Operation:** the kernel, Development Components, Service and Application Components of ODS Toolbox™ offer user interface experts a wealth of possibilities.
- **Productivity Without Boundaries:** ODS Toolbox™ is the only air traffic control oriented development toolkit out there. That's why the pre-developed air traffic management components of ODS Toolbox™ can give your user interface development team a productivity boost.
- **Unprecedented Display Performance:** the exceptional performance of ODS Toolbox™ allows displaying an almost unlimited variety of highly dynamic objects without loss of performance.
- **Secure Investment:** with its portability across all major operating and graphics platforms, ODS Toolbox™ is ready for

Meet ODS Toolbox


Graphics Engine
Dialog Manager
Object Store
IDM Script Engine
IDP

```
export MdWnTitle WnTxtMain
{
    .visible false;
    .width 160;
    .height 150;
    .title "TXT";

    rule void Toggle
    {
        if this.visible then
            this.visible := false;
            ResetTxtAction();
        else
            this.visible := true;
            EtLine1.content := "";
            EtLine2.content := "";
            EtLine1.active  := true;
        endif
    }

    on key TxtKey
    {
        WnTxtMain:Toggle();
    }
```

ENGINEERING REASONS TO MOVE AWAY FROM ODS TOOLBOX

- It's out of date - Motif based, script language lacking.
- Run-time licenced.
- In maintenance mode.
- Closed source.
- Does not provide any useful functionality not available with more modern toolkits.
- Supplier upgrade path not backward compatible.

BUSINESS REASONS TO MOVE AWAY FROM ODS TOOLBOX

- Expensive; licencing costs harm competitiveness.
- No skill resource base worth mentioning.
- Closed source.
- Supplier/support long term concerns.

SO, A REWRITE, THEN?

SO, A REWRITE, THEN?

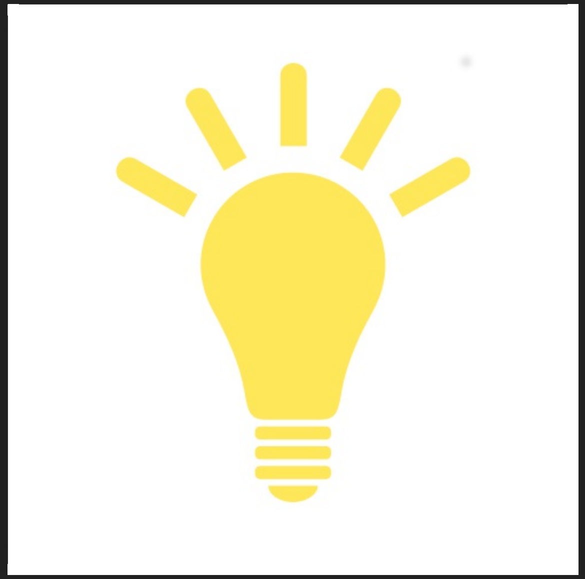
But that would be a completely new product…

SO, A REWRITE, THEN?

But that would be a completely new product...

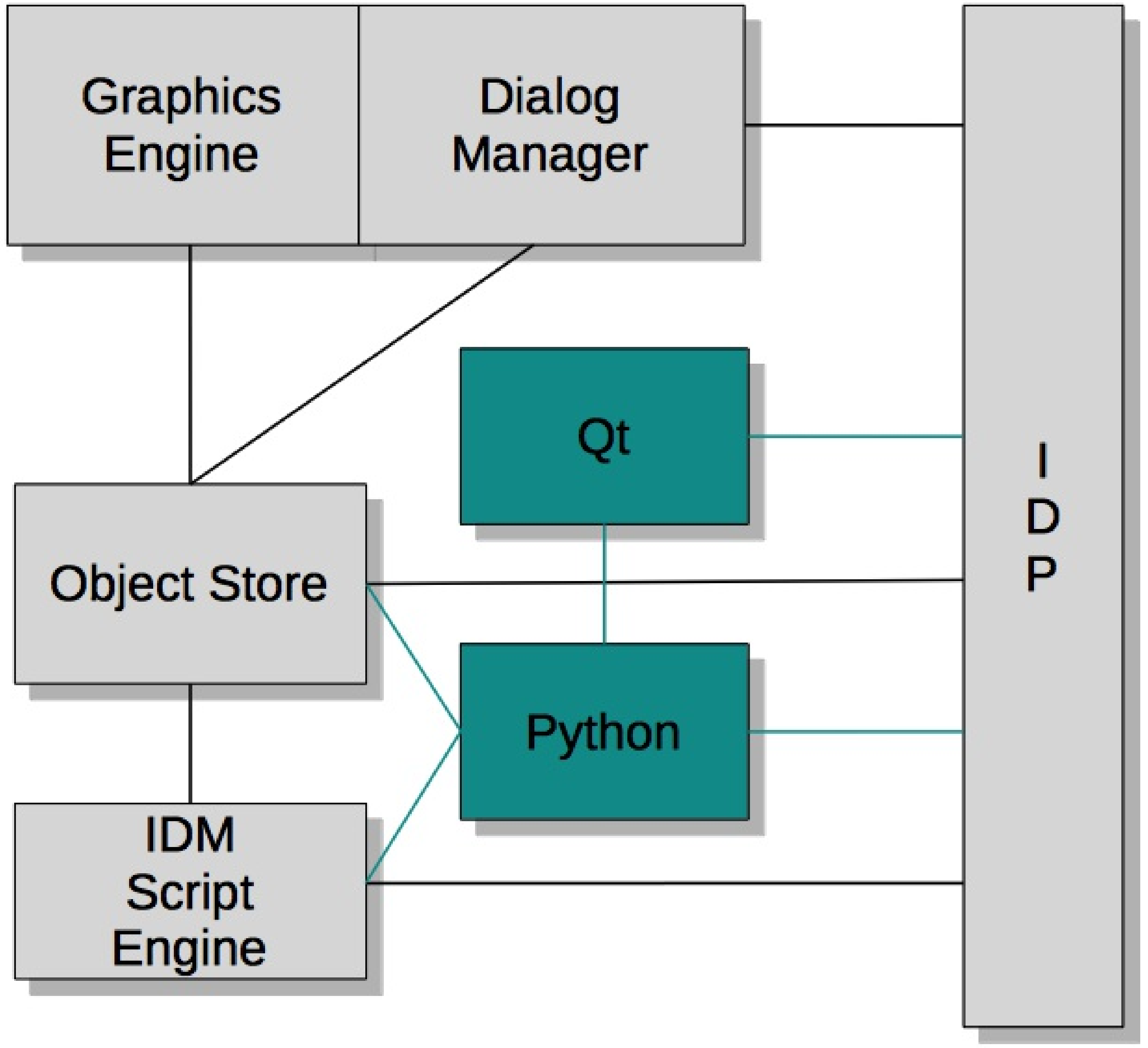
... and a large risk, for the company AND the customer.

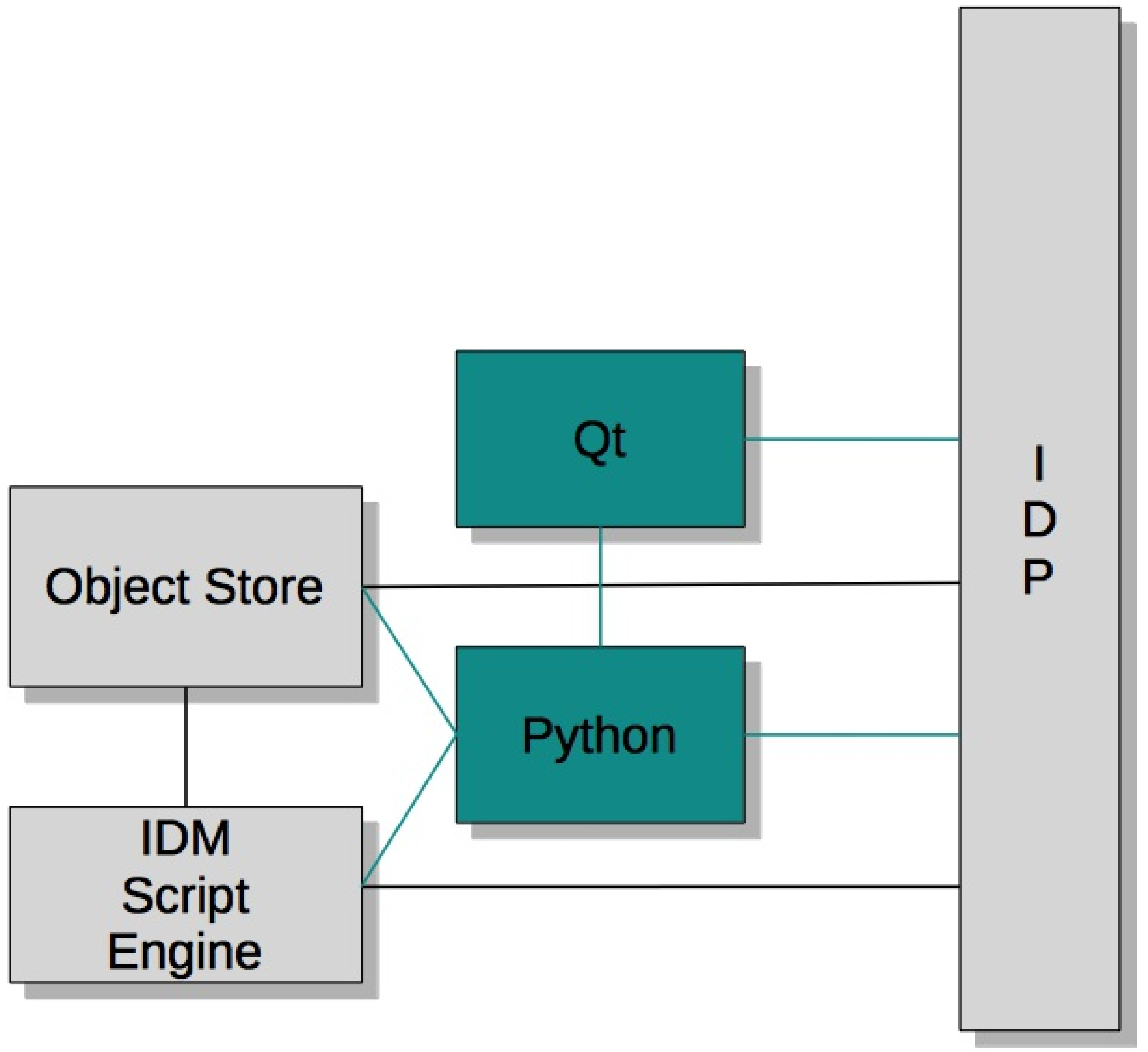
IDP is the main graphic display and a set of top-level windows. Would it be possible to have windows run by a separate graphics toolkit?

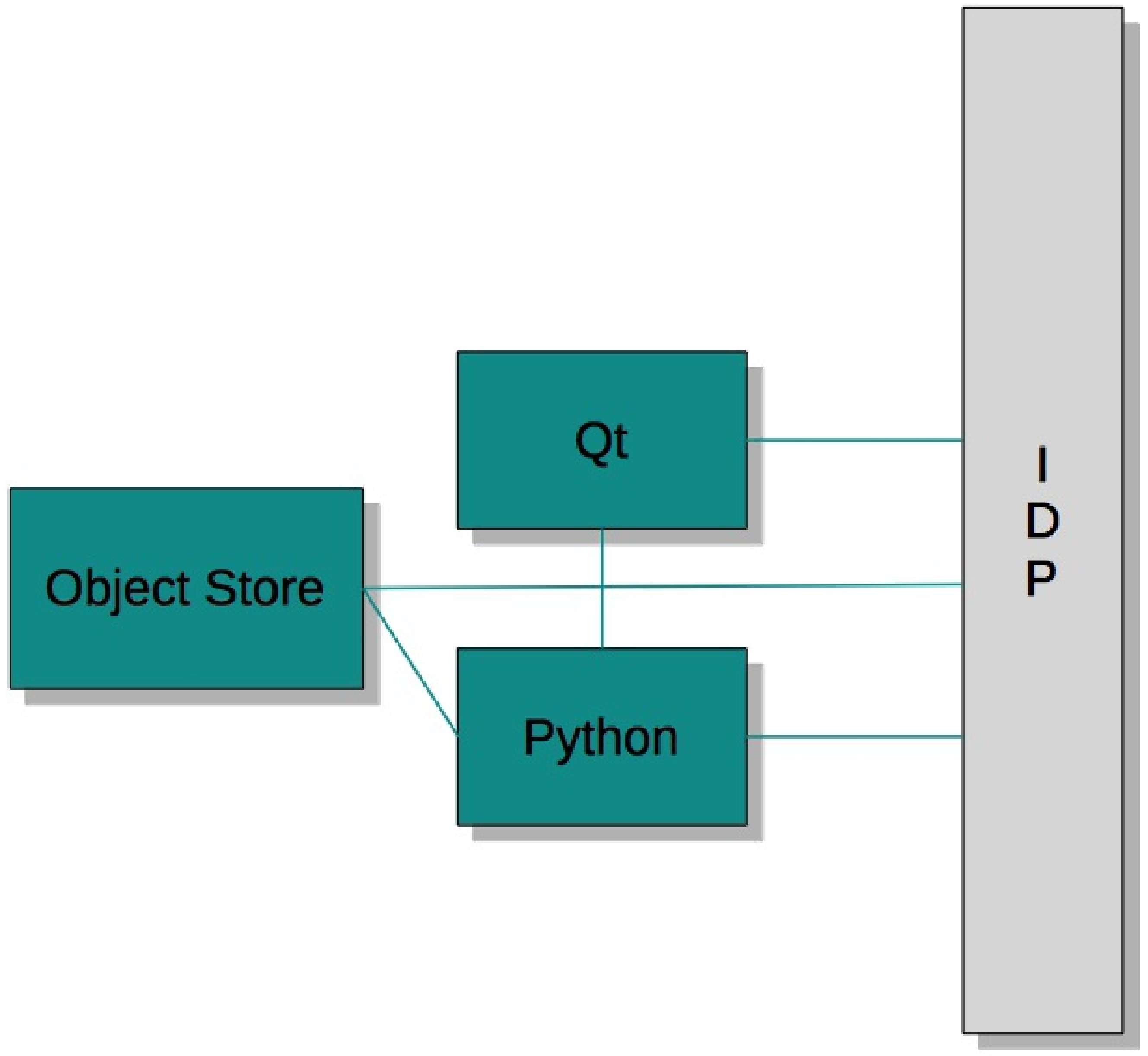


IDP is the main graphic display and a set of top-level windows. Would it be possible to have windows run by a separate graphics toolkit?

So you could re-implement functions incrementally?

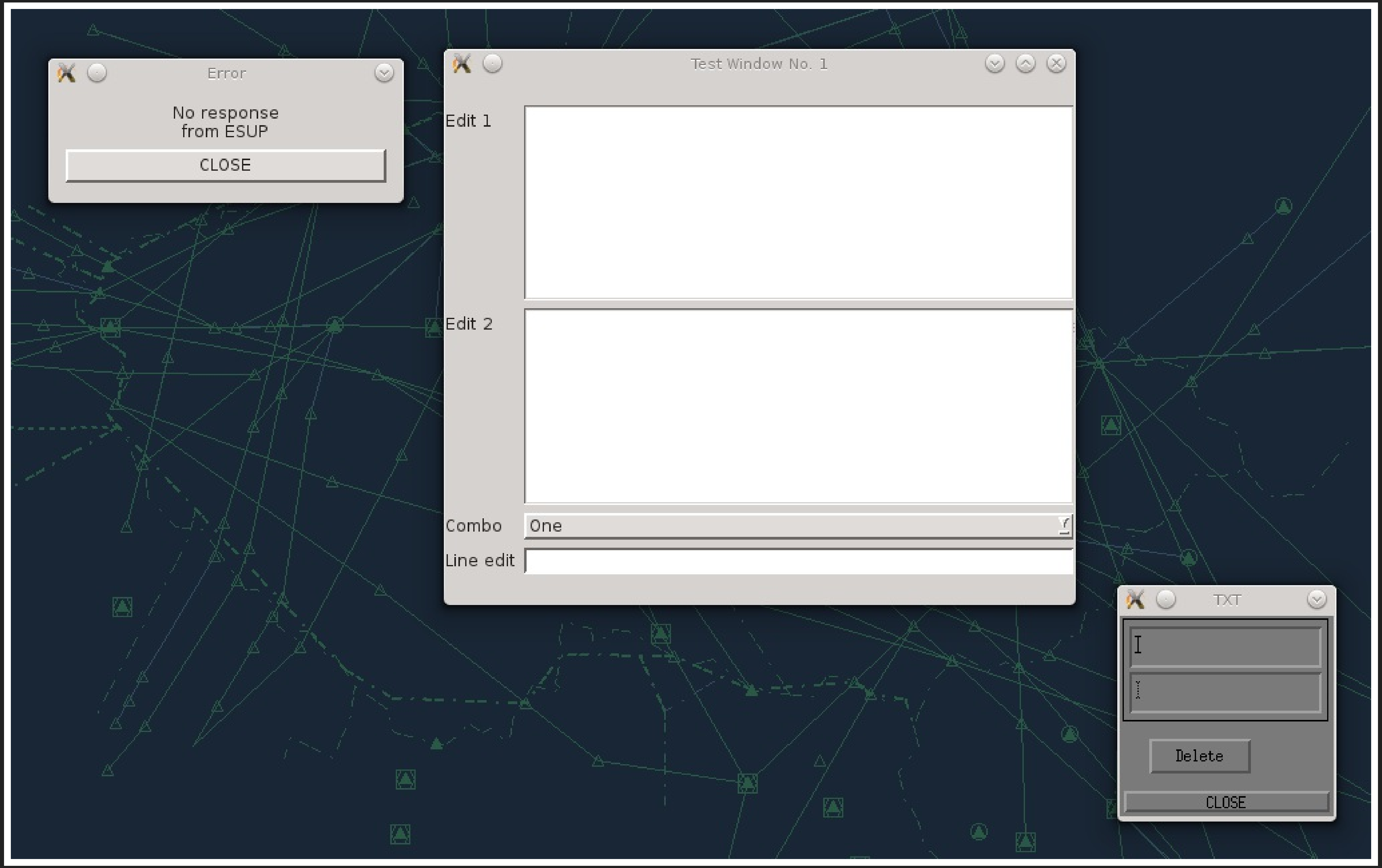

Graphics Engine
Dialog Manager
Qt
Object Store
Python
IDM Script Engine
IDP


Qt
Object Store
Python
IDM Script Engine
I D P


Qt
Object Store
Python
I
D
P

QT MOTIF EXTENSION

- Was part of Qt Enterprise Edition back in Qt3.
- Ported to Qt4 and open sourced.
- Discontinued from Qt proper.


Error
No response
from ESUP
CLOSE
Test Window No. 1
Edit 1
Edit 2
Combo
One
Line edit
TXT
Delete
CLOSE

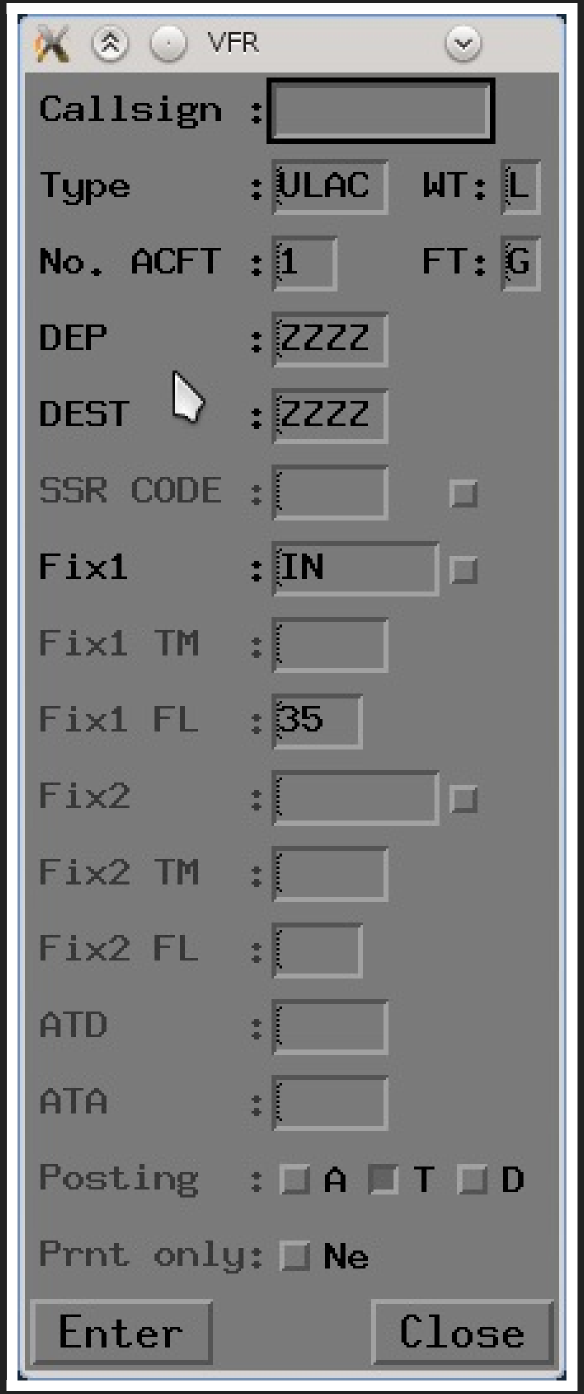
- Python interface to Object Store.
- Python interface to IDM and vice-versa.
- Translate IDM modules to Python.
- Combine ODS and Qt event loops.

```c
ODS_Initialize (&argc, argv, 0);

// Tedious stuff omitted...

if (argc > j)
    dlgname = argv[j];
else
    dlgname = strcat(argv[0], ".idm");

if (!(dialogID = ODS_LoadDialog (dlgname, 0)))
{
    ilogc_error("init", "Cannot load dialogfile %s", dlgname);
    return(1);
}
```

```
display = (Display*) DM_GetToolkitData(dialogID, AT_XDisplay);
appContext =
    (XtAppContext) DM_GetToolkitData(dialogID, AT_XtAppContext);

QtMotif motif("idp", appContext);
QApplication::setStyle("motif");
QApplication app(argc, argv);
```

```
int argv0_len = strlen(argv[0]);
std::wstring wargv0(argv0_len, L'#');
mbstowcs(&wargv0[0], argv[0], argv0_len);

PyImport_AppendInittab("_atrak", PyInit__atrak);
PyImport_AppendInittab("_idpidm", PyInit__idpidm);
PyImport_AppendInittab("_idpodsco", PyInit__idpodsco);
Py_SetProgramName(&wargv0[0]);
Py_Initialize();
```

```
PyThreadState *_save;
_save = PyEval_SaveThread();

DM_StartDialog(dialogID,0);

// Using DM_EventLoop(0) results in Qt not working properly.
// Notably, input to text fields isn't displayed until some
// major event, like a loss of focus, occurs.
//
// So we need to ensure Qt events are processed properly, but that
// ODS gets a look in too.Qt will pass events it doesn't recognise
// through to the Xt event handler, so Motif should trog along. ODS
// does the same, so Qt will get them. But both need to run other stuff.
for (;;)
{
    // It's tempting to call DM_EventLoop(DMF_WaitForEvent), but
    // that stalls Qt noticeably. So use Qt to wait for events.
    motif.processEvents(QEventLoop::AllEvents |
                        QEventLoop::WaitForMoreEvents);
    DM_EventLoop(DMF_DontWait);
}

PyEval_RestoreThread(_save);
Py_Finalize();
```

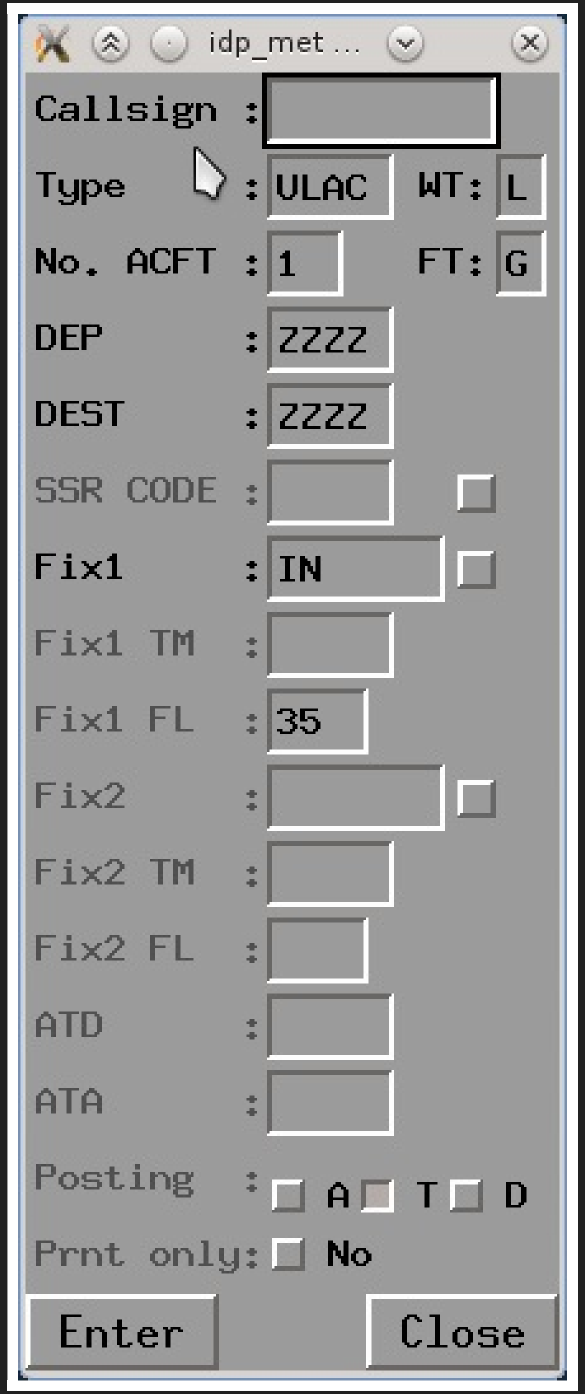


VFR

Callsign	:		
Type	: ULAC	WT:	L
No. ACFT	: 1	FT:	G
DEP	: ZZZZ		
DEST	: ZZZZ		
SSR CODE	:	☐	
Fix1	: IN	☐	
Fix1 TM	:		
Fix1 FL	: 35		
Fix2	:	☐	
Fix2 TM	:		
Fix2 FL	:		
ATD	:		
ATA	:		
Posting	: ☐ A ☐ T ☐ D		
Prnt only:	☐ Ne		

Enter Close

Motif



idp_met ...

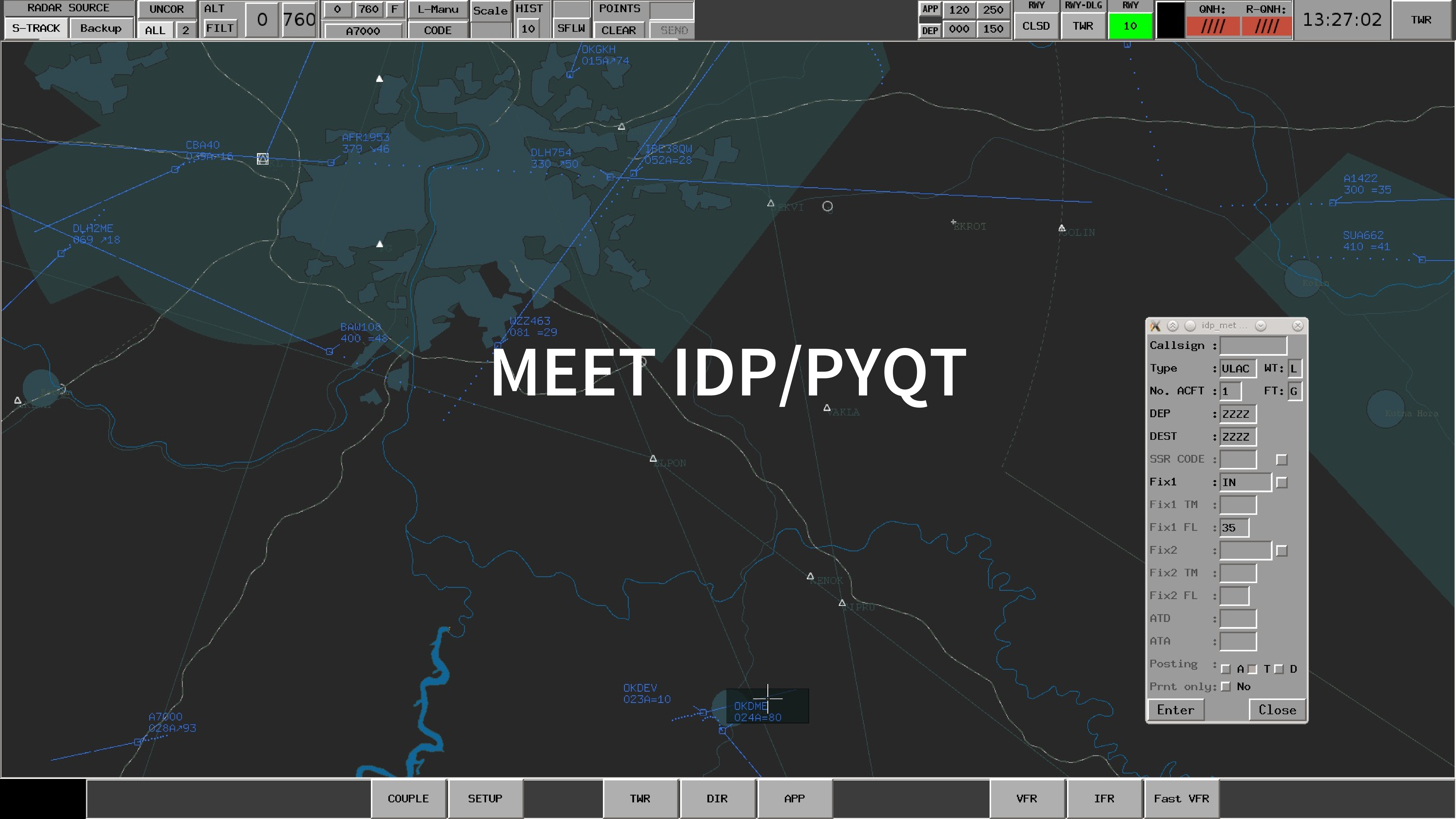
Callsign	:		
Type	: ULAC	WT:	L
No. ACFT	: 1	FT:	G
DEP	: ZZZZ		
DEST	: ZZZZ		
SSR CODE	:	☐	
Fix1	: IN	☐	
Fix1 TM	:		
Fix1 FL	: 35		
Fix2	:	☐	
Fix2 TM	:		
Fix2 FL	:		
ATD	:		
ATA	:		
Posting	: ☐ A ☐ T ☐ D		
Prnt only:	☐ No		

Enter Close

Qt

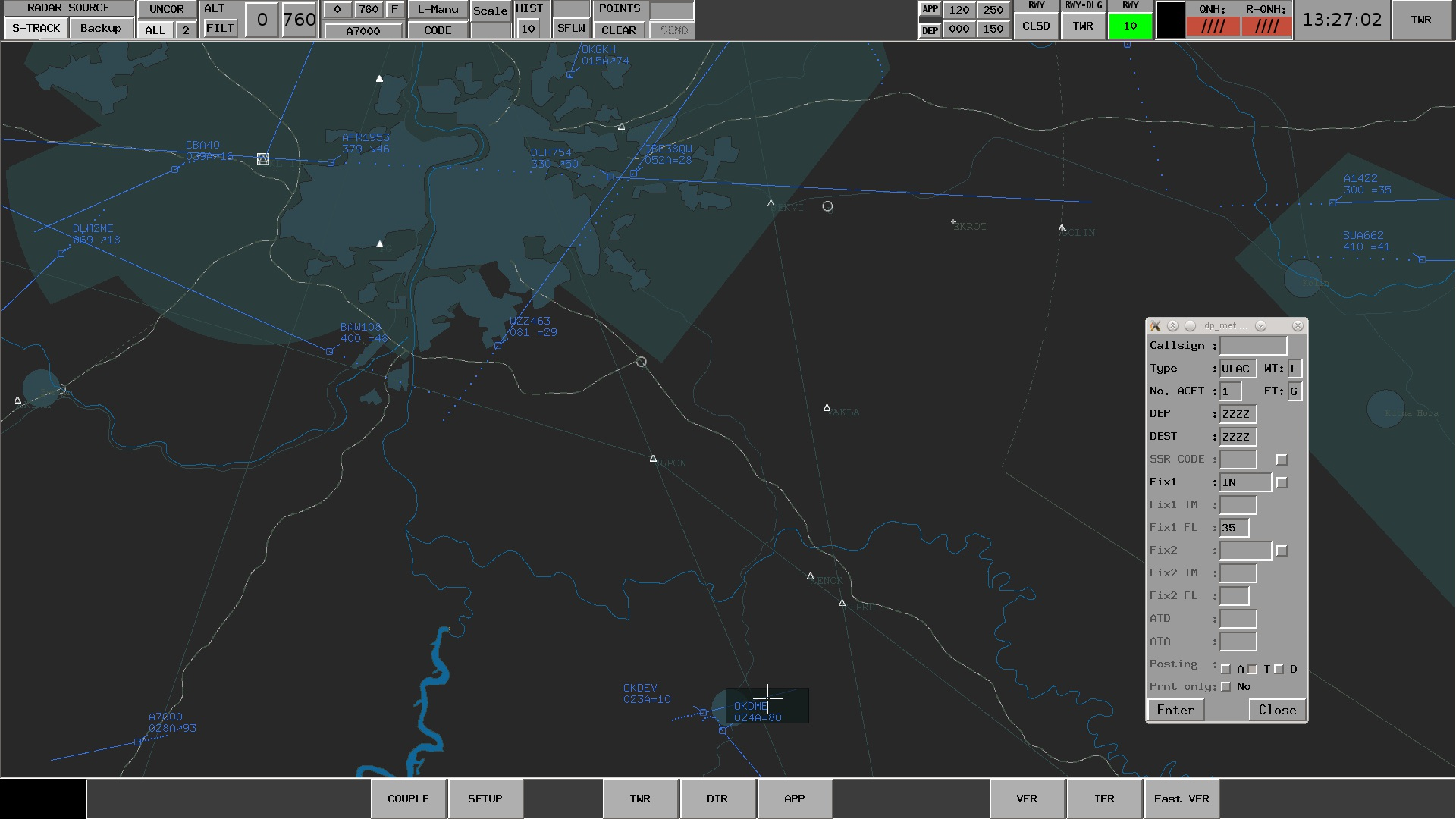
DRUM ROLL, PLEASE….

MEET IDP/PYQT



Callsign :	
Type :	ULAC WT: L
No. ACFT :	1 FT: G
DEP :	ZZZZ
DEST :	ZZZZ
SSR CODE :	
Fix1 :	IN
Fix1 TM :	
Fix1 FL :	35
Fix2 :	
Fix2 TM :	
Fix2 FL :	
ATD :	
ATA :	
Posting :	☐ A ☐ T ☐ D
Prnt only:	☐ No

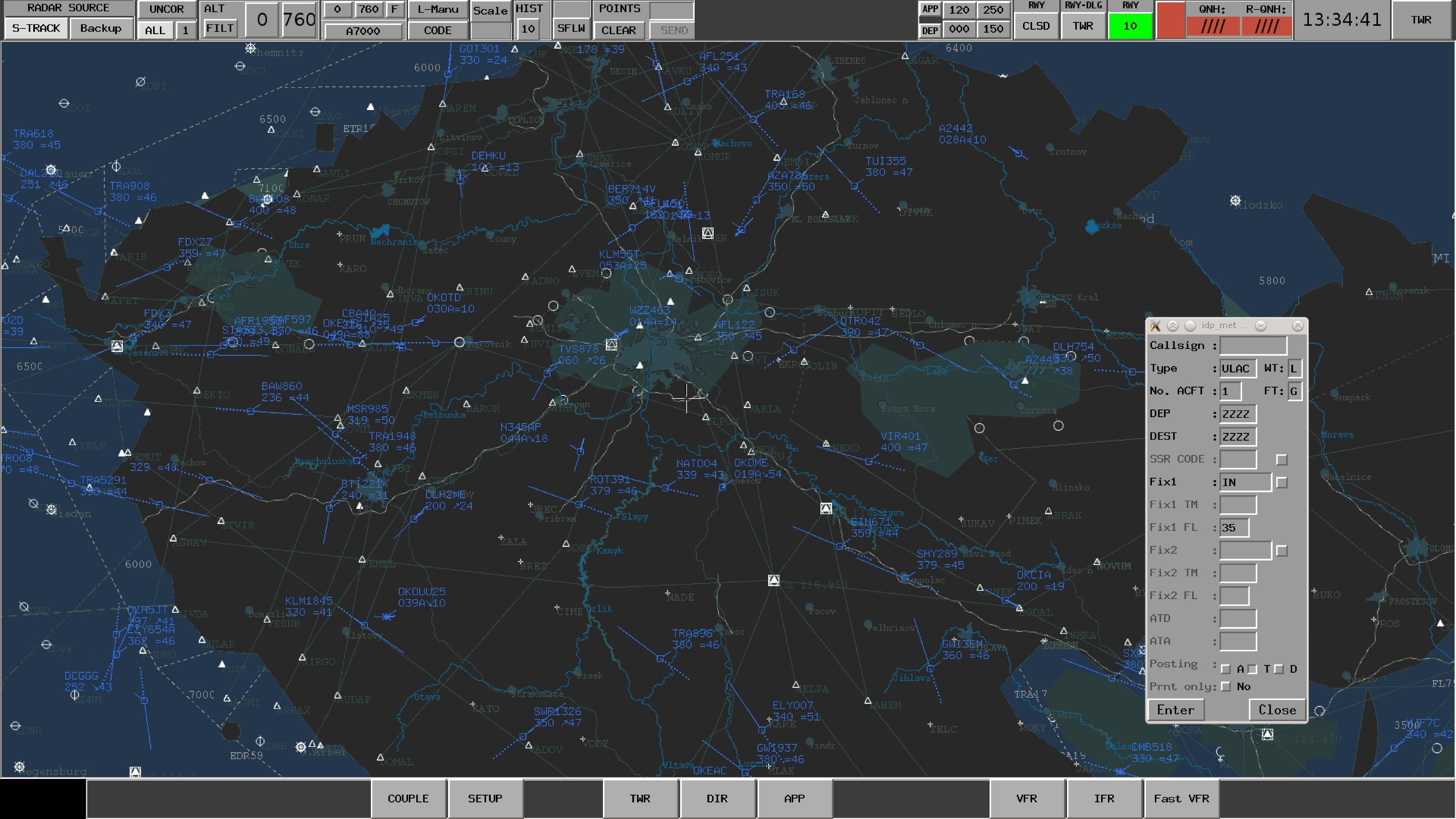
Enter Close



idp_met ...

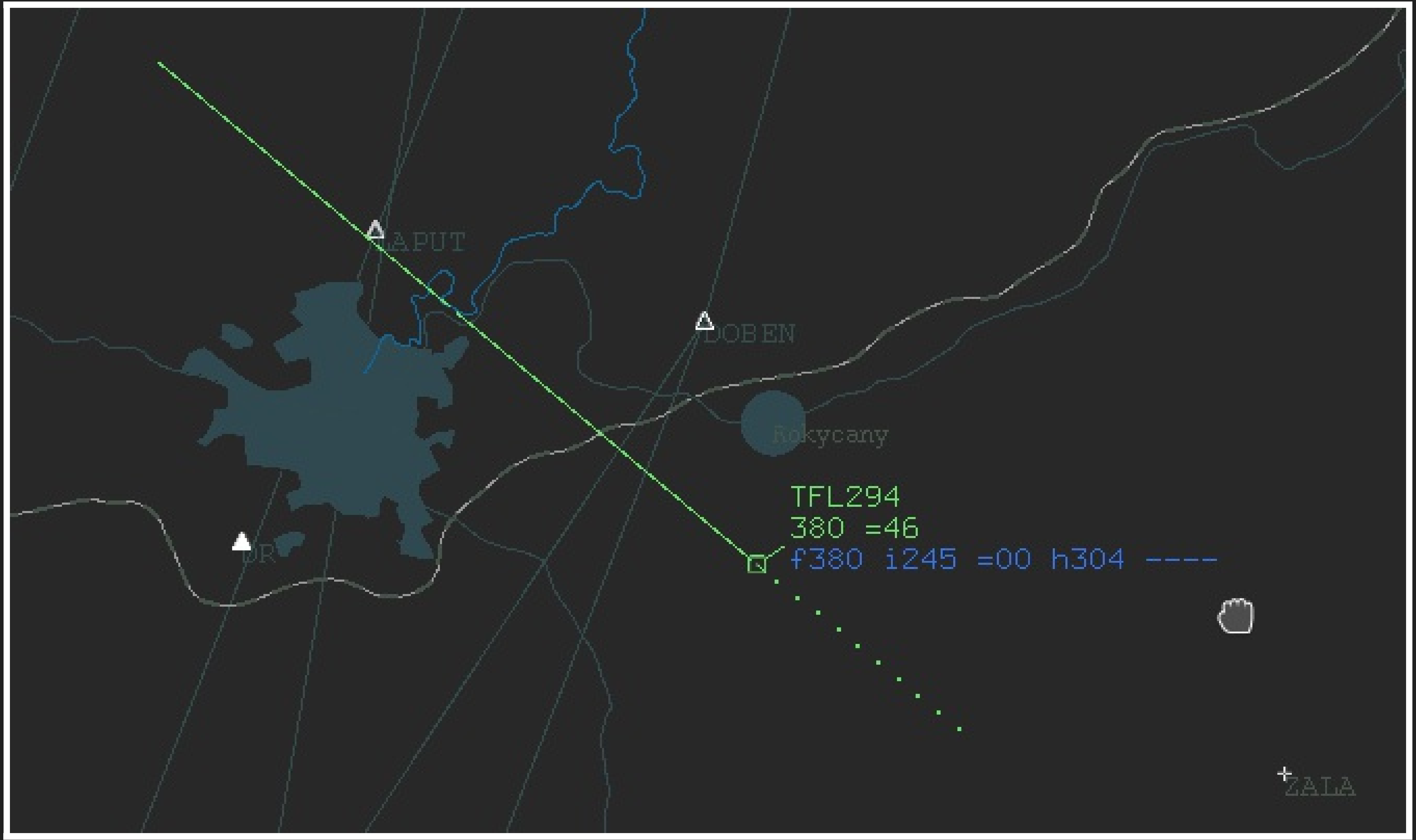
Callsign :	
Type :	ULAC WT: L
No. ACFT :	1 FT: G
DEP :	ZZZZ
DEST :	ZZZZ
SSR CODE :	☐
Fix1 :	IN ☐
Fix1 TM :	
Fix1 FL :	35
Fix2 :	☐
Fix2 TM :	
Fix2 FL :	
ATD :	
ATA :	
Posting :	☐ A ☐ T ☐ D
Prnt only:	☐ No

Enter Close



Callsign	:		
Type	: ULAC	WT:	L
No. ACFT	: 1	FT:	G
DEP	: ZZZZ		
DEST	: ZZZZ		
SSR CODE	:		☐
Fix1	: IN		☐
Fix1 TM	:		
Fix1 FL	: 35		
Fix2	:		☐
Fix2 TM	:		
Fix2 FL	:		
ATD	:		
ATA	:		
Posting	: ☐ A ☐ T ☐ D		
Prnt only:	☐ No		

Enter Close



TFL294
380 =46
f380 i245 =00 h304 ----

WHERE ARE WE NOW?

Project is still in progress.

WHERE ARE WE NOW?

Project is still in progress.

ODS is not yet removed.

WHERE ARE WE NOW?

Project is still in progress.

ODS is not yet removed.

All graphics now in Qt.

WHERE ARE WE NOW?

Cautiously optimistic that project goal will be achieved.

WHERE ARE WE NOW?

Cautiously optimistic that project goal will be achieved.

Customer is engaged.

WHERE ARE WE NOW?

Cautiously optimistic that project goal will be achieved.

Customer is engaged.

Yes, more development work required than a full rewrite...

WHERE ARE WE NOW?

Cautiously optimistic that project goal will be achieved.

Customer is engaged.

Yes, more development work required than a full rewrite...

... but development cost and risk are only part of a project's overall cost and risks.

Viktor

Petr

Martin

Radek

- Lightbulb icon, Subhashish Panigrahi, Wikimedia Commons.
- Roadworks image, Ian Britton, FreeFoto.com, CCA-NN.