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#include <R.h>
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#include <Rinternals.h>
```

C type of all R objects

Quick R API cheat sheet by Simon Urbanek, 3/2012

typeof(SEXP x)

LENGTH(SEXP x)

isNull(x)

native vectors

<i>type</i>	<i>payload</i>	<i>accessor</i>	<i>scalar constructor, coercion to scalar, type check</i>
INTSXP	int*	INTEGER(x)	ScalarInteger, asInteger, isInteger
REALSXP	double*	REAL(x)	ScalarReal, asReal, isReal [tools: ISNA(x), ISNAN(x), R_FINITE(x)]
LGLSXP	int*	LOGICAL(x)	ScalarLogical, asLogical, isLogical
CPLXSXP	Rcomplex*	COMPLEX(x)	ScalarComplex, asComplex, isComplex
RAWSXP	Rbyte*	RAW(x)	ScalarRaw, --, typeof(x) == RAWSXP

other vectors

VECSXP	VECTOR_ELT(x, index)	SET_VECTOR_ELT(x, index, value)	any
STRSXP	STRING_ELT(x, index)	SET_STRING_ELT(x, index, value)	CHARSXP
CHARSXP	<i>(payload of STRSXP only!)</i>		
	SEXP mkString(const char *)		
	SEXP mkChar(const char *), SEXP mkCharCE(const char*, {CE_NATIVE CE_UTF8 CE_LATIN1})		
	const char *CHAR(x), const char* translateCharUTF8(x)		

alloc

<u>allocation/coercion</u>			
allocVector(type, length)	allocMatrix(type, m, n)	mkNamed(type, const char **names {..., ""})	
duplicate(x)	coerceVector(x, type)		

out

<u>stop/warning/output (printf-style arguments)</u>			
error(format, ...)	warning(format, ...)	Rprintf(format, ...)	REprintf(format, ...)

globals, sym

<u>most common global variables</u>			
R_NilValue = NULL	R_GlobalEnv = .GlobalEnv	R_NaString = NA_character_	
R_NaInt = NA_integer_	R_NaReal = NA_real_	R_NaN, R_PosInf, R_NegInf	
<u>symbols (only most common - see Rinternals.h for the full list)</u>			
R_NamesSymbol, R_DimSymbol, R_DimNamesSymbol, R_RowNamesSymbol, R_ClassSymbol			
any other symbol: install(const char* symbol_name)			

attr

<u>attributes</u>	
setAttrib(x, symbol, value)	getAttrib(x, symbol)

pairlists

<u>pairlists</u>	
LISTSXP: [CAR = payload, TAG = symbol/name, CDR = next LISTSXP or R_NilValue (=end)]	
constructor: CONS(car=payload, cdr=next)	
list1(e1) ~ CONS(e1, R_NilValue)	list2(e1, e2) ~ CONS(e1, CONS(e2)) list3 ...
LANGSXP = LISTSXP with language objects, LCONS ~ CONS, lang1 ~ list1, lang2 ~ list2, ...	
example: SEXP rnorm = install("rnorm"), x = eval(lang2(rnorm, ScalarInteger(10)), R_GlobalEnv);	

protection

<u>protection</u>			
GC can be run at any <i>allocation</i> so R objects must be protected in some way if they are to be kept across any additional allocations. Protect is a stack so the number of PROTECT calls must match <i>count</i> in UNPROTECT. Objects contained in other objects are automatically protected by the enclosing object.			
PROTECT(x)	UNPROTECT(count)	R_PreserveObject(x)	R_ReleaseObject(x)

silly example

```
.Call("replicate_to_list", x, n): NOTE: Must *always* return a valid value! Even if it is R_NilValue
SEXP replicate_to_list(SEXP x, SEXP N) {
  int n = asInteger(N);
  if (n < 0) error("N must be non-negative");
  SEXP res = allocVector(VECSXP, n);
  for (int i = 0; i < n; i++) SET_VECTOR_ELT(res, i, x);
  return res;
}
```

```
$ R CMD SHLIB foo.c
> dyn.load("foo.so") # or foo.dll
```