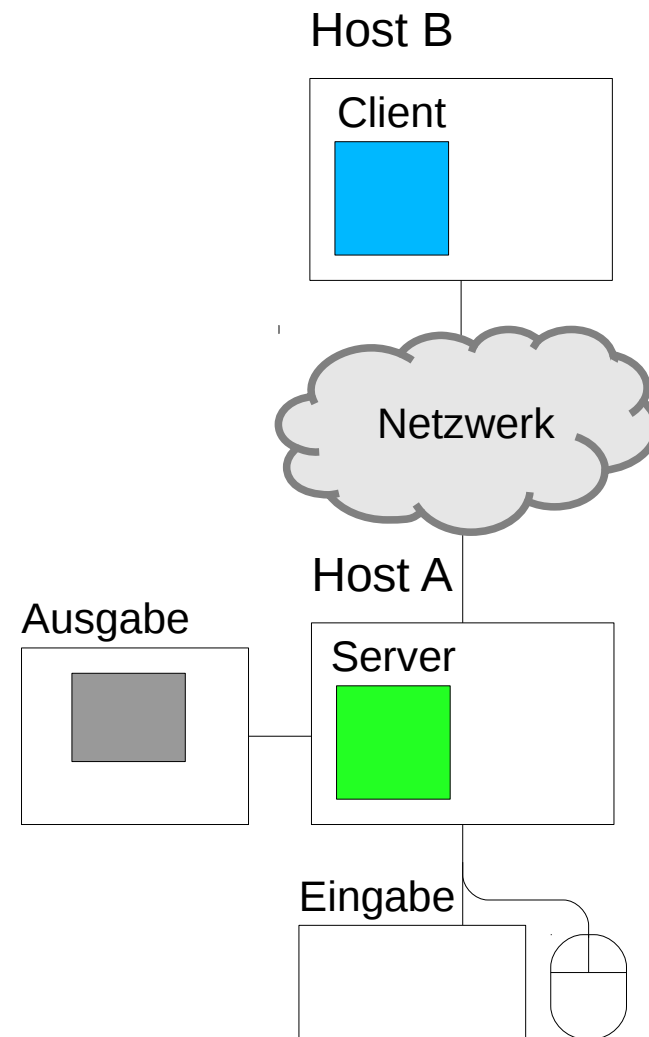


X Protokoll

Netzwerk Protokoll

- **Client / Server Architektur**
 - Server
 - Eingabe
 - Ausgabe
 - Client
 - Anwendung

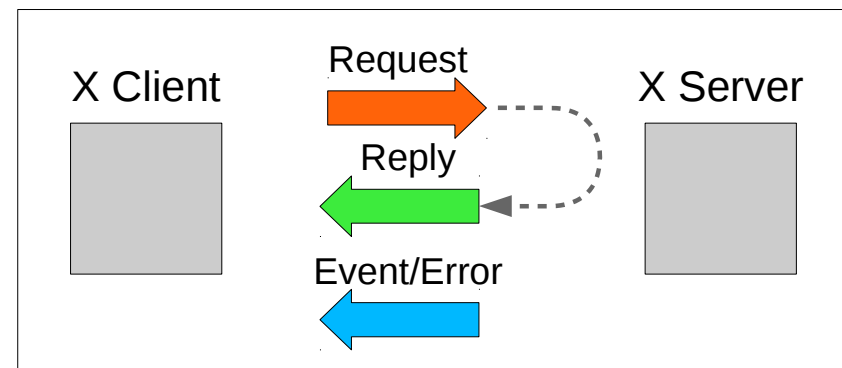


Anforderungen

Was brauchen wir?

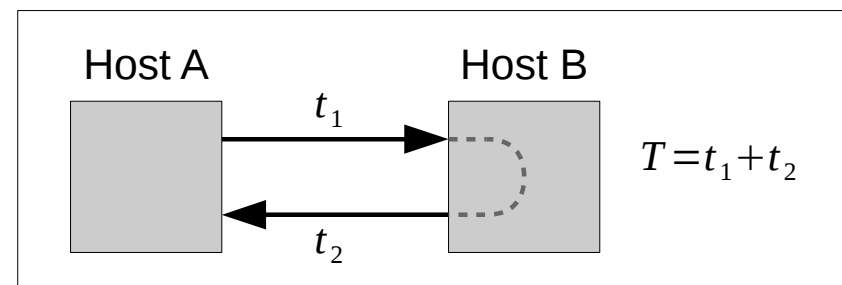
- **Nachrichten**

- Request
- Reply
- Event
- Error



- **möglichst asynchron**

- vermeide Round Trip Time



Technische Umsetzung

Format

- **Client → Server**
 - Request

- **Server → Client**
 - Reply
 - Event
 - Error

Error Format 32 bytes

0	code	sequence number
minor		major

Request Format (variabel)

major		length

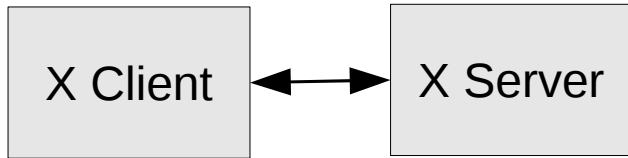
Reply Format (variabel)

1	code	sequence number
length		

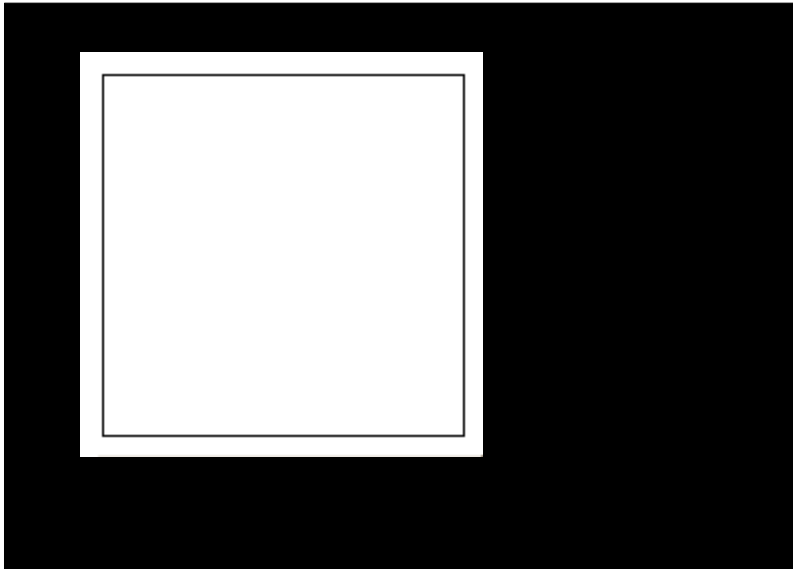
Event Format 32 bytes

major		sequence number

Ein (ver)einfach(t)es Szenario

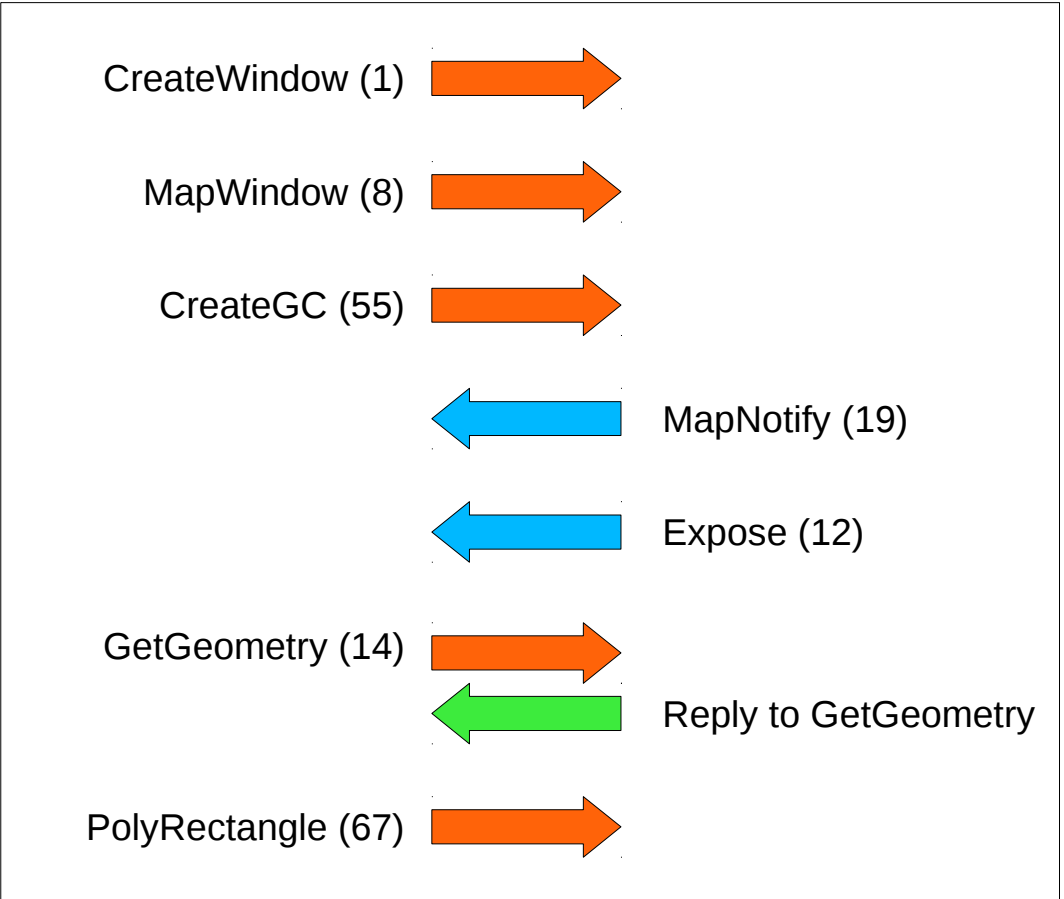


./a.out



X Client

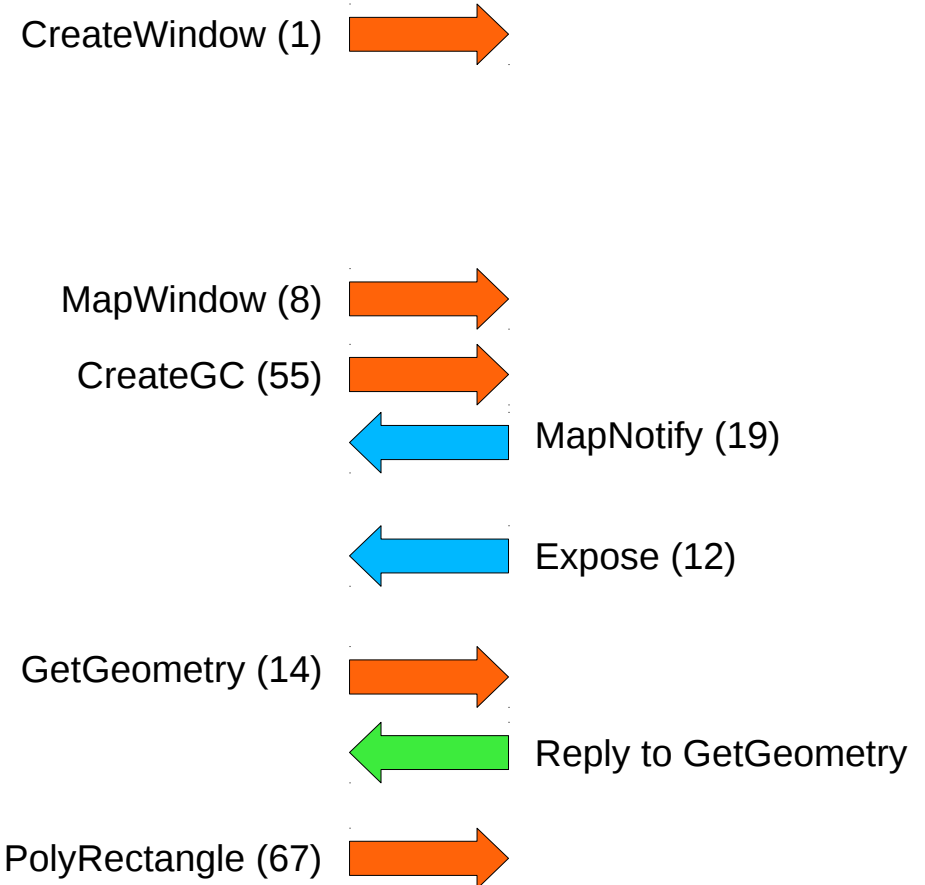
X Server



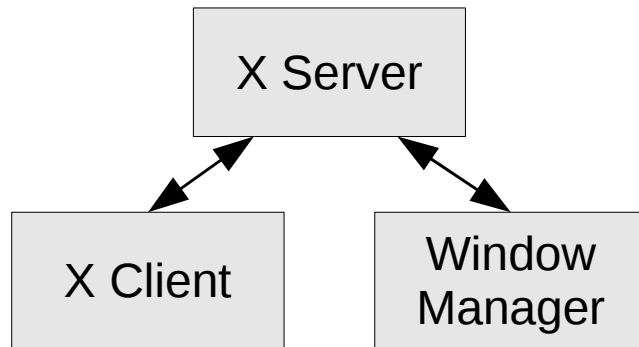
Das Beispiel in der Praxis

```
xtrace ./a.out
```

```
000:<:0007: 40: Request(1): CreateWindow
  depth=0x00 window=0x00200001 parent=0x00000112
  x=0 y=0 width=200 height=200 border-width=0
  class=InputOutput(0x0001)
  visual=CopyFromParent(0x00000000)
  value-list={backgroun-pixel=0x00ffffff
              event-mask=Exposure,StructureNotify}
000:<:0008: 8: Request(8): MapWindow
  window=0x00200001
000:<:0009: 16: Request(55): CreateGC
  cid=0x00200002 drawable=0x00200001 values={}
000:>:0009: Event MapNotify(19)
  event=0x00200001 window=0x00200001
  override-redirect=false(0x00)
000:>:0009: Event Expose(12)
  window=0x00200001
  x=0 y=0 width=200 height=200 count=0x0000
000:<:000a: 8: Request(14): GetGeometry
  drawable=0x00200001
000:>:000a:32: Reply to GetGeometry:
  depth=0x18 root=0x00000112
  x=0 y=0 width=200 height=200 border-width=0
000:<:000b: 20: Request(67): PolyRectangle
  drawable=0x00200001 gc=0x00200002
  rectangles={x=10 y=10 w=180 h=180}
```



Ein kompizierteres Szenario



./a.out



xtrace ./a.out

```

000:<:0007: 40: Request(1): CreateWindow ...
000:<:0008: 8: Request(8): MapWindow ...
000:<:0009: 16: Request(55): CreateGC ...

000:>:0009: Event ReparentNotify(21)
  event=0x05000001 window=0x05000001
  parent=0x01268278 x=0 y=0
  override-redirect=false(0x00)
000:>:0009: Event ConfigureNotify(22)
  event=0x05000001 window=0x05000001
  above-sibling=None(0x00000000)
  x=1 y=25 width=200 height=200 border-width=0
  override-redirect=false(0x00)
000:>:0009: Event (generated) ConfigureNotify(22)
  event=0x05000001
  window=0x05000001 above-sibling=None(0x00000000)
  x=2 y=100 width=200 height=200
  border-width=0 override-redirect=false(0x00)

000:>:0009: Event MapNotify(19) ...
000:>:0009: Event Expose(12) ...
000:<:000a: 8: Request(14): GetGeometry ...
000:>:000a:32: Reply to GetGeometry ...
000:<:000b: 20: Request(67): PolyRectangle ...
  
```

Was ist da los?

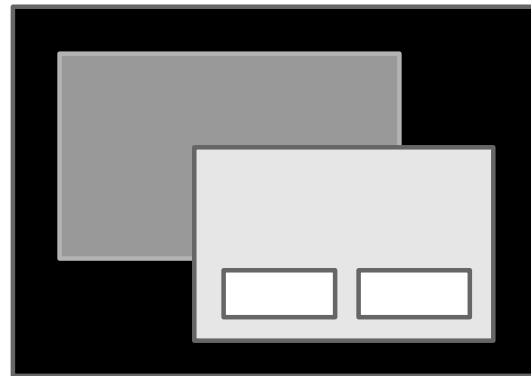
Resourcenverwaltung

- XServer → n Screens
- Screen → 1 RootWindow
- Window → n Windows
- Windows eines Screens → Baum

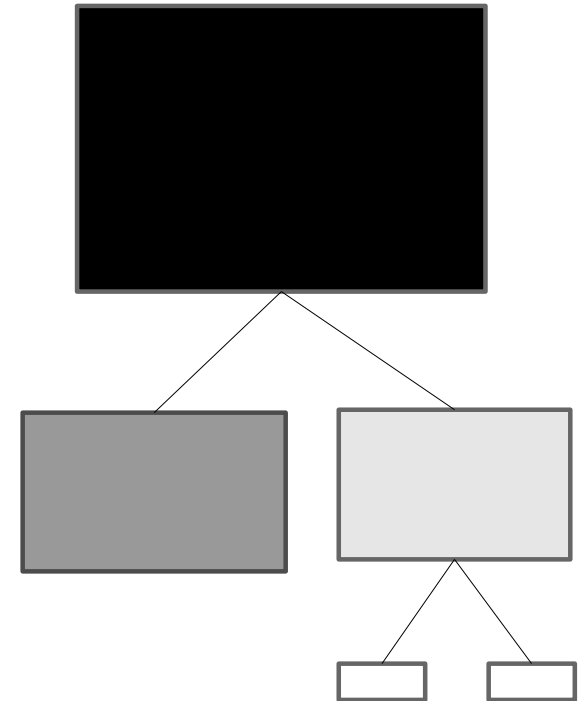
Screen



Screen

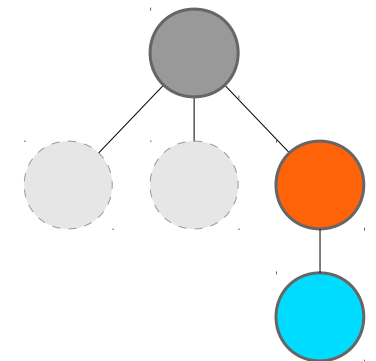
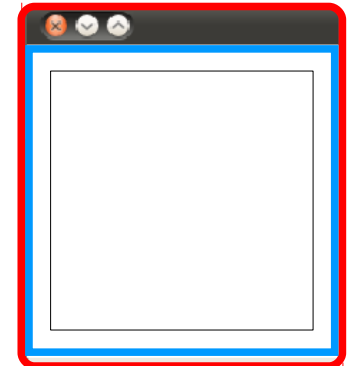
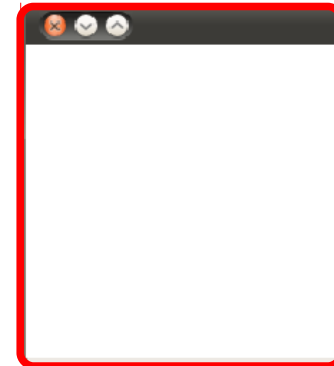
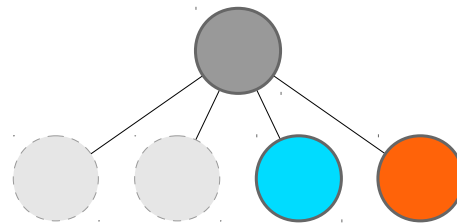
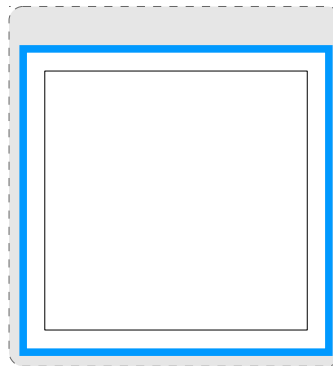
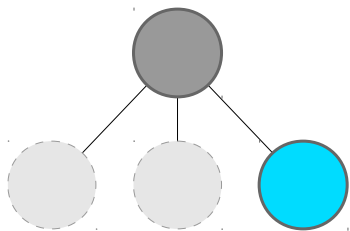
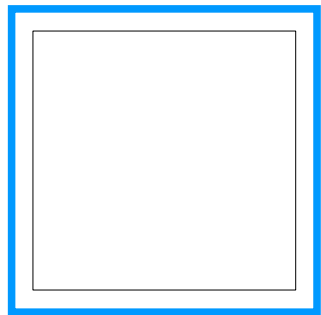


RootWindow



Reparenting

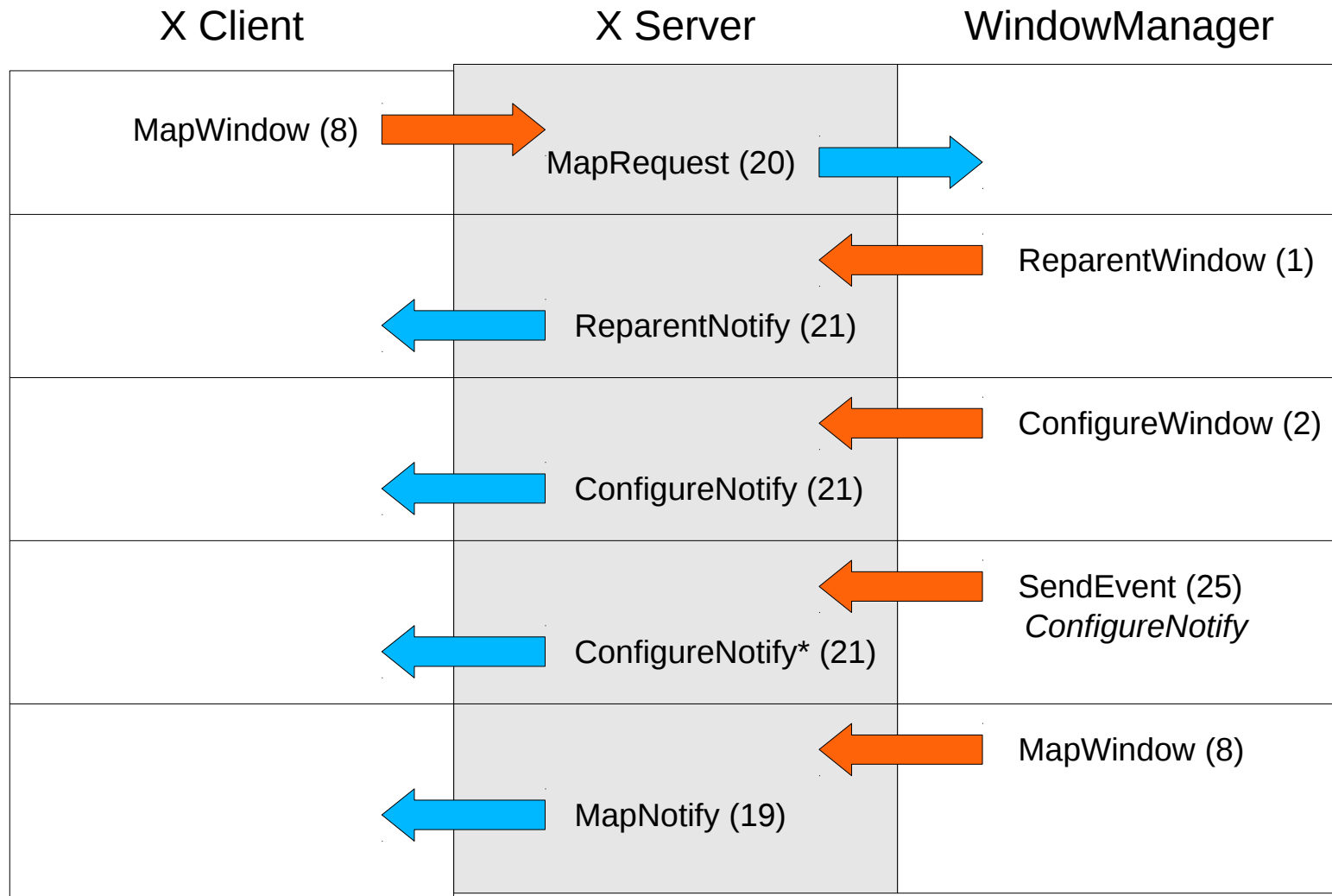
Für das Beispiel



Prima !

- **Und woher kommt der Titel ?**
 - Zeichnen muss ihn der Window Manager
 - Wissen kann ihn nur der Client

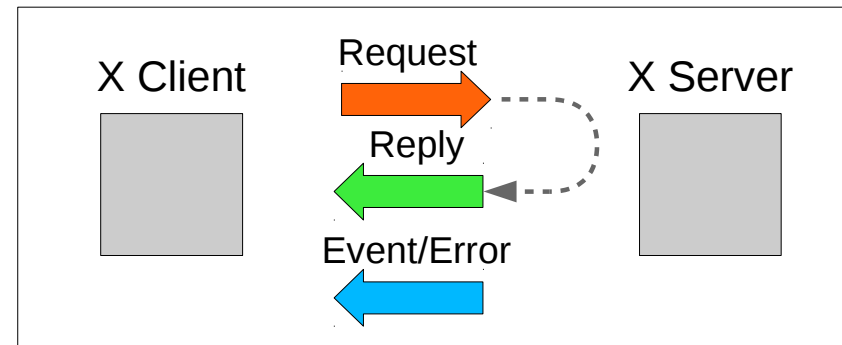
Rückblick – das haben wir gesehen



IPC

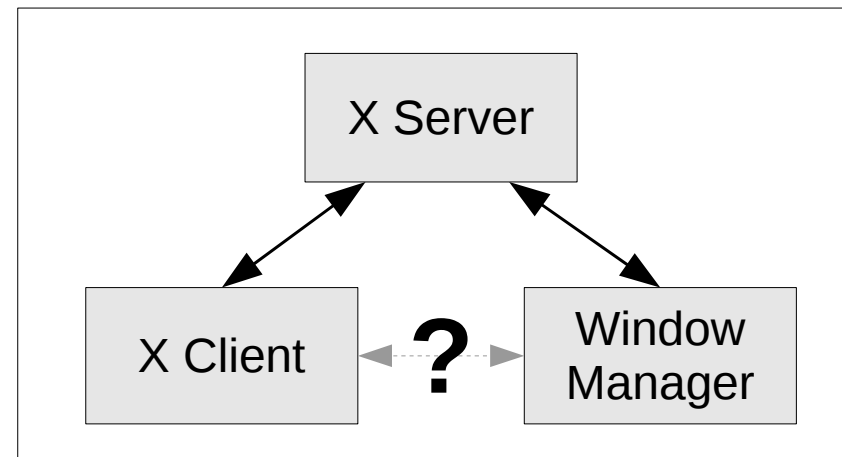
Informationsaustausch

- **Client – Server** ✓



- **Client – Client** !!

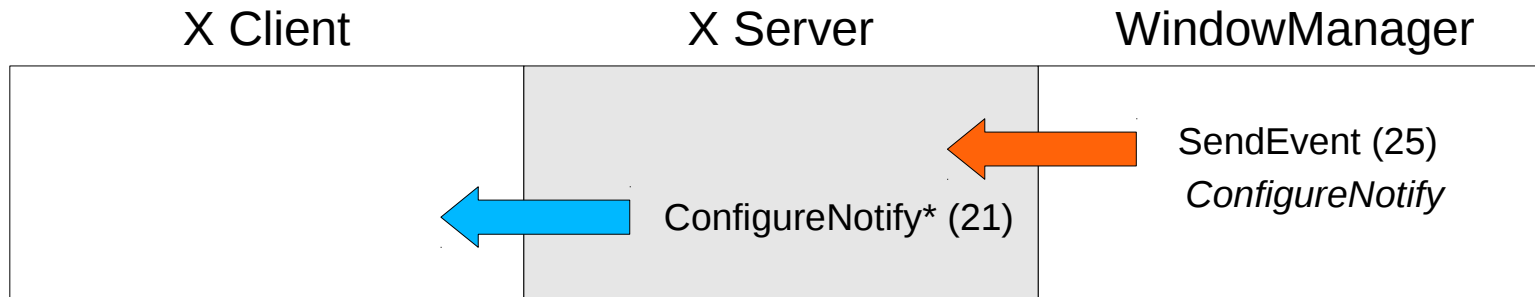
- ClientMessage
- Properties
- (Selections)



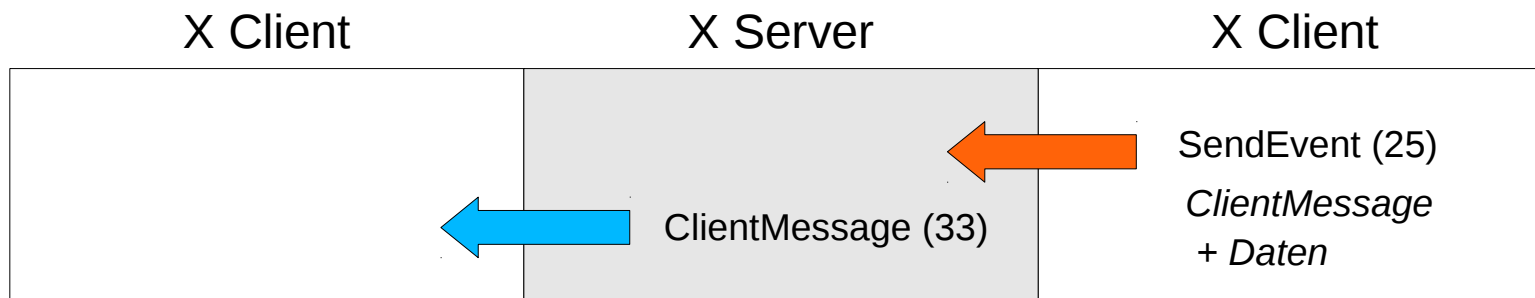
stille Post - ClientMessage

Etwas ganz ähnliches haben wir doch schon gemacht !

- **letztes Beispiel**



- **wir bräuchten bloß ein allgemeineres Event**

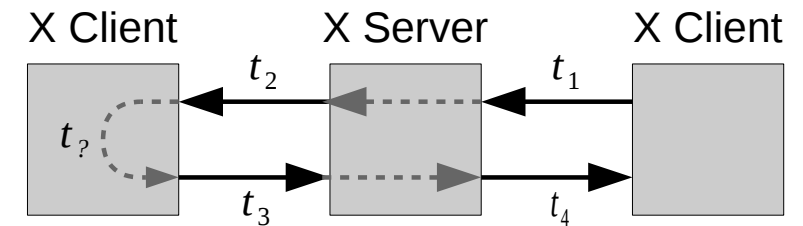
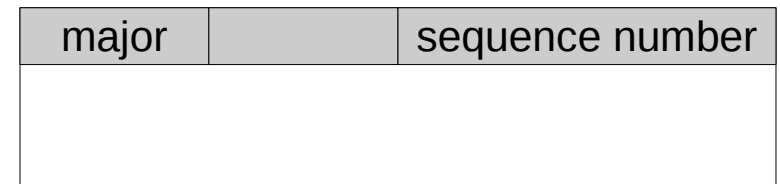


Einschränkungen

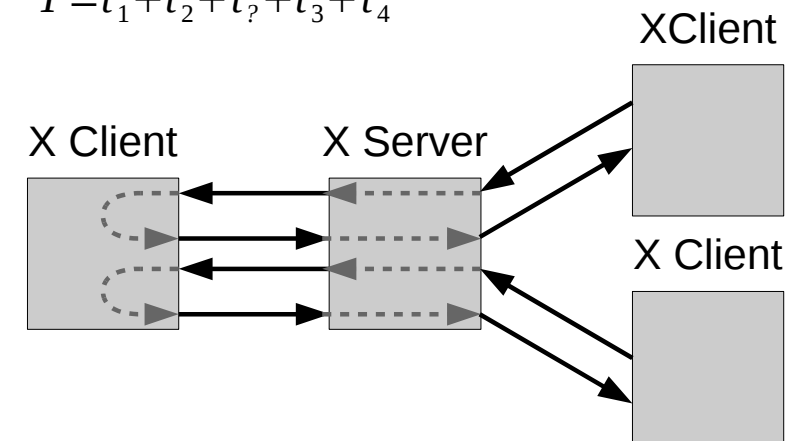
- **Kapazität**
 - Event Paket max. 20 byte Daten
- **Laufzeit**
 - besonders lange Leitung
 - ... und wenn der Befragte gerade rechnet ?
 - besonders ärgerlich bei mehreren Kunden

Event Format

32 bytes

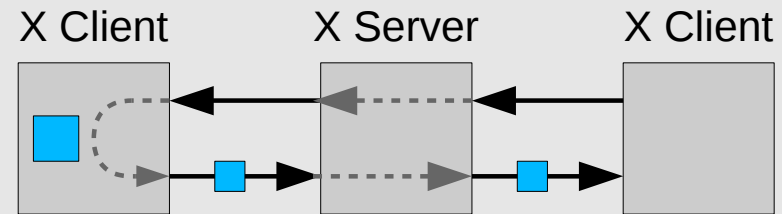


$$T = t_1 + t_2 + t_? + t_3 + t_4$$

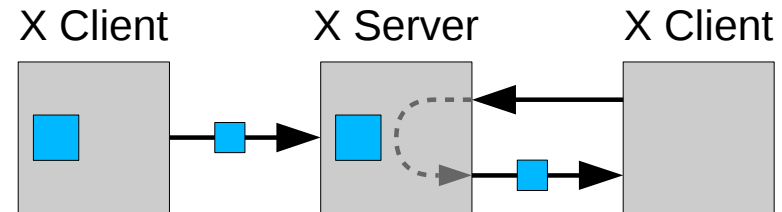


toter Briefkasten statt stiller Post!

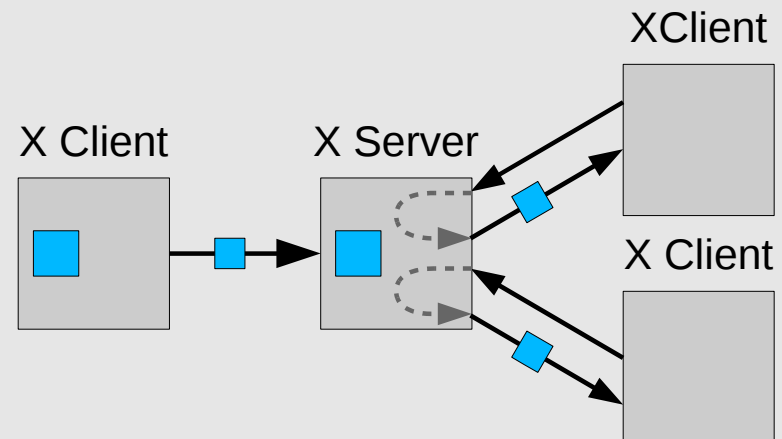
so lief es bisher



das hier ist der neue Plan



viele Kunden - kein Problem



Properties

Atome

- **Zahl → Text**
 - Statt vollem Text muss nur eine Zahl ausgetauscht werden

xlsatoms

```

...
4   ATOM
5   BITMAP
6   CARDINAL
...
39  WM_NAME
...
626 _NET_WM_WINDOW_TYPE_COMBO

```

Properties

- **Name (Atom)**
- **Typ (Atom)**
- **Wert**

xprop

```

...
_NET_WM_WINDOW_TYPE(ATOM) = _NET_WM_WINDOW_TYPE_NORMAL
...
WM_NORMAL_HINTS(WM_SIZE_HINTS):
    program specified minimum size: 475 by 194
    window gravity: NorthWest
WM_PROTOCOLS(ATOM): protocols WM_DELETE_WINDOW, WM_TAKE_FOCUS,
_NET_WM_PING, _NET_WM_SYNC_REQUEST
WM_CLASS(STRING) = "gedit", "Gedit"
WM_ICON_NAME(STRING) = "Ungespeichertes Dokument 1 - gedit"
WM_NAME(STRING) = "Ungespeichertes Dokument 1 - gedit"
_NET_WM_NAME(UTF8_STRING) = 0x55, 0x6e, 0x67, 0x65,
...

```

Standards

ICCCM

- **Selections**
- **Kommunikation: Client - Windowmanager**
 - WM_NAME (TEXT)
 - WM_ICON_NAME (TEXT)
 - WM_NORMAL_HINTS (WM_SIZE_HINTS)
 - WM_HINTS (WM_HINTS)
 - WM_CLASS (STRING)
 - WM_TRANSIENT_FOR (WINDOW)
 - WM_PROTOCOLS (ATOM) : WM_TAKE_FOCUS WM_SAVE_YOURSELF WM_DELETE_WINDOW
 - WM_COLORMAP_WINDOWS (WINDOW)
 - WM_CLIENT_MACHINE
 - WM_STATE (WM_STATE)
 - WM_ICON_SIZE (CARDINAL)
- **Session Management**
- **Shared Resources**

EWMH

