Who?

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with help from Tejun Heo
Most newer OS designs started around powerful IPC
Mach, QNX, Hurd, . . .
Linux only had IPC primitives (sockets, fifos, shared memory)
D-Bus is powerful IPC

Method Call Transactions,
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Established, it’s the single most used local, high-level IPC system on Linux, bindings for most languages
Used in init system (regardless if systemd or Upstart), the desktops, embedded, ...
kdbus

Suitable for large data (GiB!), zero-copy, optionally reusable

It's efficient (2 or fewer copies, 2 validations, 2 context switches per duplex method call transaction)

Credentials sent along are comprehensive (uid, pid, gid, selinux label, pid starttime, tid, comm, tid comm, argv, exe, cgroup, caps, . . .)

Implicit timestamping

Always available, from earliest boot to latest shutdown

Open for LSMs to hook into from the kernel side

Activation is identical to activation of other services

Userspace is much simpler, no XML, . . .

Priority queues, . . .

Race-free exit-on-idle for bus activated services

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D-Bus in the Kernel
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D- Bus in the Kernel
Overview
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Receiver buffers
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Receiver buffers

Single copy to destination(s)
Overview

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Single copy to destination(s)

Method call windows
Overview

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Single copy to destination(s)

Method call windows

Name registry
memfds
memfds

File descriptors for memory regions
memfds
File descriptors for memory regions
Zero Copy!
memfds
File descriptors for memory regions
Zero Copy!
Sealing
memfds

File descriptors for memory regions

Zero Copy!

Sealing

At 512K zero copy is faster than single copy
memfds

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(a bit like Android ashmem)
Signal Broadcasting

Every broadcast message includes bloom filter (calculated by sender) that contains all supported matches, kernel will then simply check receiver bloom filter mask (calculated by receiver) against it.

Bloom filter uses SipHash, but kernel doesn’t care.
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Policy:
No XML, only simple ACL policy attached to service names.
More fine-grained access control needs to be done in userspace, but it's much easier.
Use capability checks!
PolicyKit
D-Bus in the Kernel
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Setup, activation, policy management, driver, proxy lives in systemd
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GVariant used for marshalling \(O(1)\) random access to struct and array fields

Setup, activation, policy management, driver, proxy lives in systemd

New libsystemd-bus client library: waaaaay nicer to use – but not portable to non-Linux
Proxy: provides compatibility with dbus1 sockets
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Synthesizes obsolete AcquiredName, LostName, Hello messages
Proxy: provides compatibility with dbus1 sockets
Synthesizes obsolete AcquiredName, LostName, Hello messages
Implements XML policy
Proxy: provides compatibility with dbus1 sockets
Synthesizes obsolete AcquiredName, LostName, Hello messages
Implements XML policy
Activated on demand, exits on idle
Proxy: provides compatibility with dbus1 sockets
Synthesizes obsolete AcquiredName, LostName, Hello messages
Implements XML policy
Activated on demand, exits on idle
Remarshal gvariant/dbus1
Driver: translates driver method calls into ioctl calls
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Activated on demand, exits on idle
Activation: new .busname unit type in systemd
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Identical to .socket unit types for socket activation
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dbus1 bus activation files still supported, but only for clients connecting via the proxy
libsystemd-bus
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New client library, designed to be easy to use
libsystermd-bus

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Not portable to non-Linux
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Assemble and parse messages with format strings
libsystemd-bus

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Handles introspection, signal dispatching, method vtables, properties, object manager
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Lots of convenience functions
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Focus on converting errno from/to bus errors
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Credentials include units, slices, sessions, . . .
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It’s probably what you want to use when you hack on system level software, and up
Android binder
Android binder

Some similar technical concepts, different semantics
Android binder

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No name registry, no broadcasts, no ordering
When?
When?

It’s all in kdbus git, and systemd git, now!
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Compile-time switch in systemd
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Google for git repos!
Outlook
Outlook
Sandboxing
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Sandboxing

Yielding CPU time to destination
Outlook

Sandboxing

Yielding CPU time to destination

Priority inheritance
Outlook

Sandboxing

Yielding CPU time to destination

Priority inheritance

Priority queues

...
That’s all, folks!