A Framework for Studying Clones In Large Software Systems

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Oct. 1st, 2007

What is a clone?

- Identical or similar segments of code

linux-2.6.16.13\drivers\net\ne2.c : 285 - 295

```
#ifndef MODULE
struct net_device * __init ne2_probe(int unit)
{
        struct net_device *dev = alloc_ei_netdev();
        int err;

        if (!dev)
                return ERR_PTR(-ENOMEM);

        sprintf(dev->name, "eth%d", unit);
        netdev_boot_setup_check(dev);

        err = do_ne2_probe(dev);
        if (err)
                goto out;
        return dev;
out:
        free_netdev(dev);
        return ERR_PTR(err);
}
#endif
```

(A)

linux-2.6.16.13\drivers\net\lne390.c: 152 - 162

```
#ifndef MODULE
struct net_device * __init lne390_probe(int unit)
{
        struct net_device *dev = alloc_ei_netdev();
        int err;

        if (!dev)
                return ERR_PTR(-ENOMEM);

        sprintf(dev->name, "eth%d", unit);
        netdev_boot_setup_check(dev);

        err = do_lne390_probe(dev);
        if (err)
                goto out;
        return dev;
out:
        free_netdev(dev);
        return ERR_PTR(err);
}
#endif
```

(B)

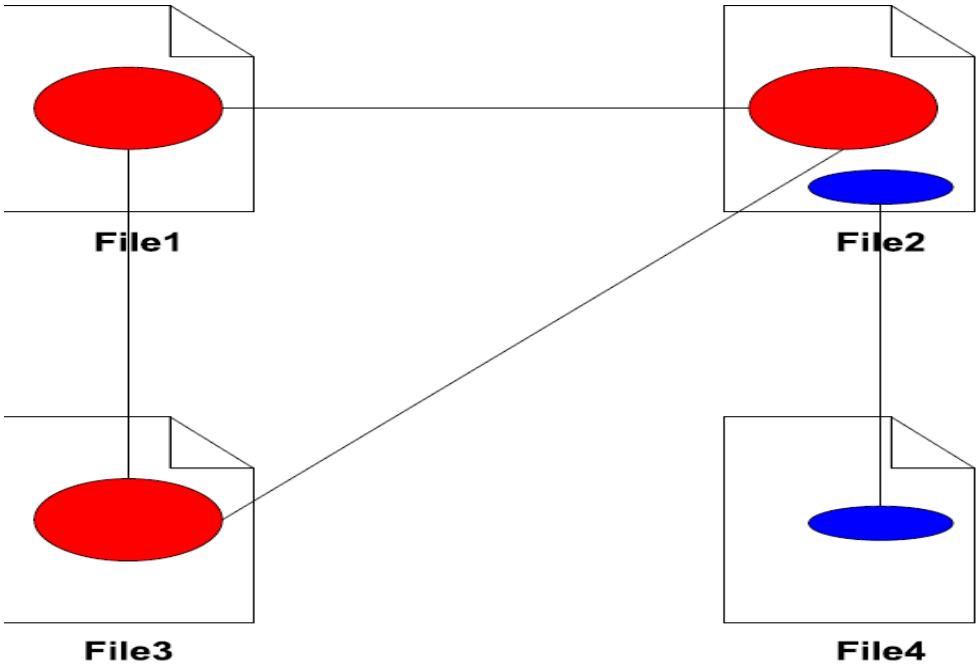
linux-2.6.16.13\drivers\net\lance.c: 437 - 447

```
#ifndef MODULE
struct net_device * __init lance_probe(int unit)
{
        struct net_device *dev = alloc_etherdev(0);
        int err;

        if (!dev)
                return ERR_PTR(-ENODEV);

        sprintf(dev->name, "eth%d", unit);
        netdev_boot_setup_check(dev);

        err = do_lance_probe(dev);
        if (err)
                goto out;
        return dev;
out:
        free_netdev(dev);
        return ERR_PTR(err);
}
#endif
```

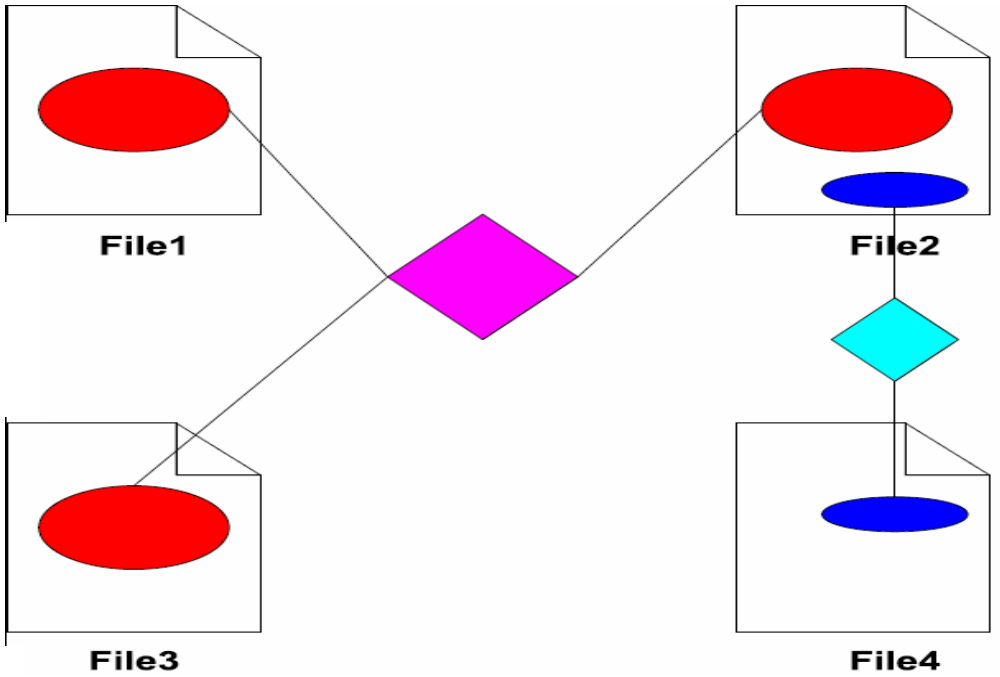
(C)

Clone Representations

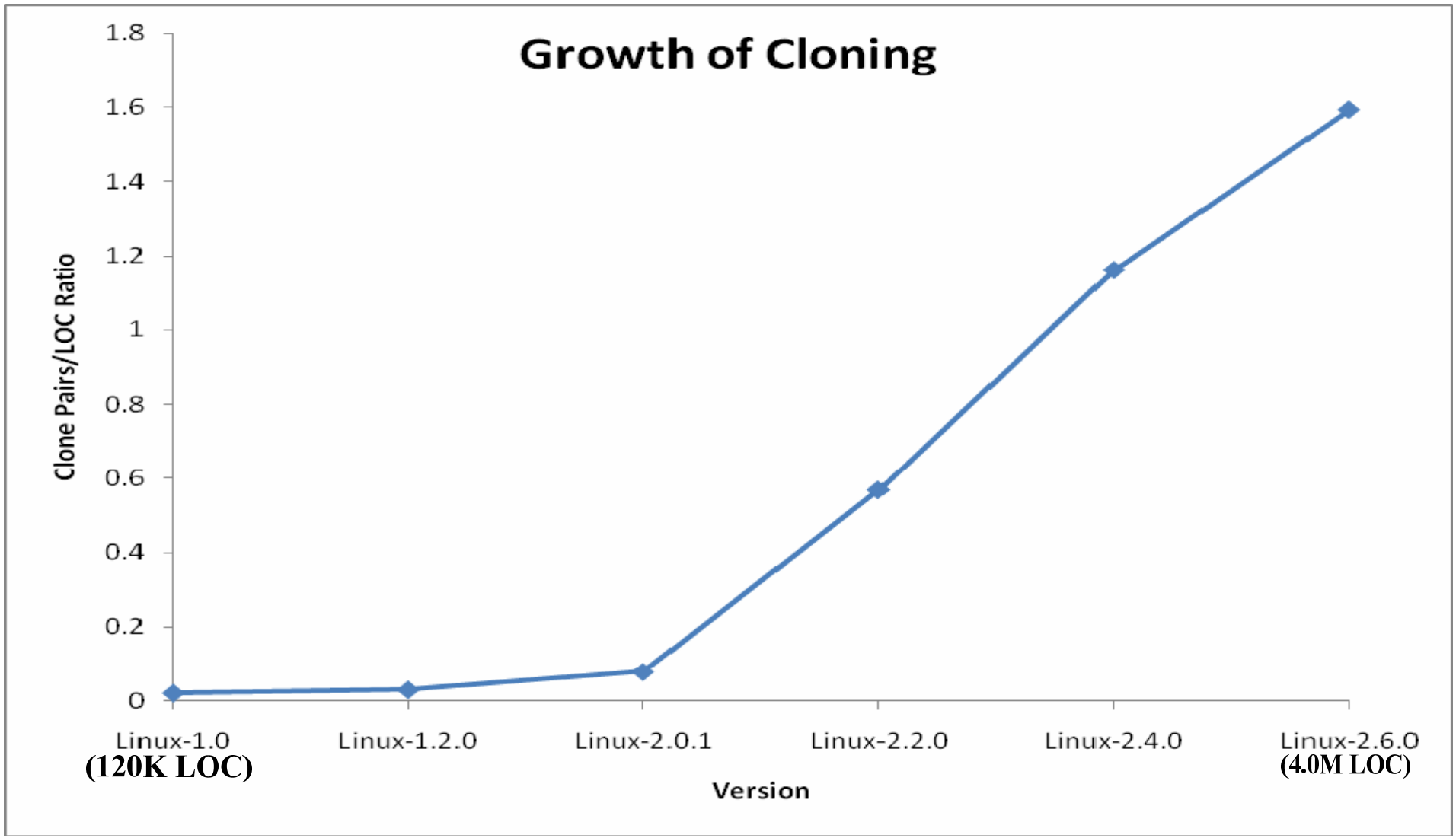
Clone Pairs



Clone Classes



Evolution of Code Clones



Problems With Clone Detection Output

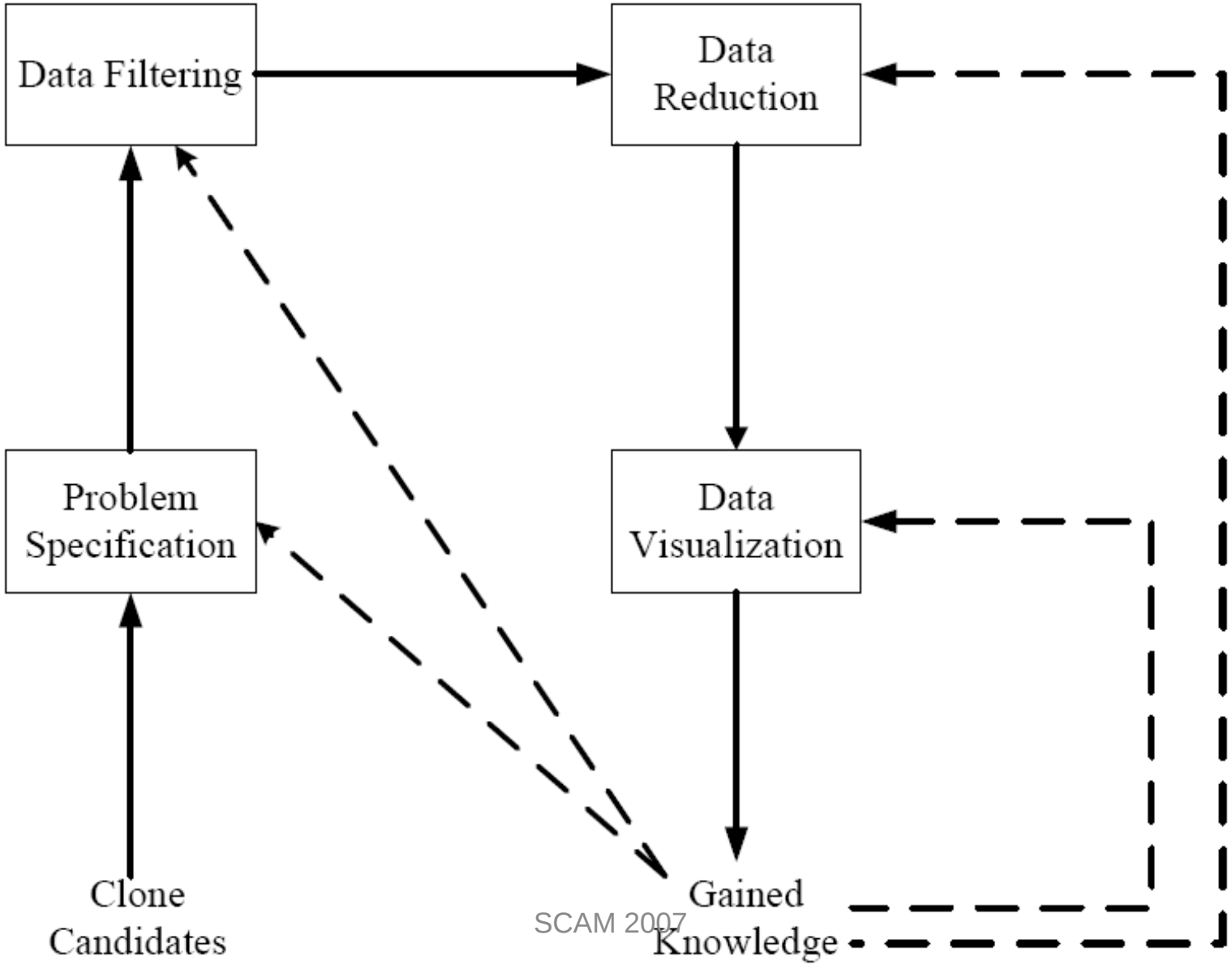
linux-2.6.16.13/drivers/scsi/aha152x.c:	linux-2.6.16.13/drivers/scsi/esp.c:

static void datai_init(struct Scsi_Host *shpnt);
static void datai_run(struct Scsi_Host *shpnt);
static void datai_end(struct Scsi_Host *shpnt);
static void datao_init(struct Scsi_Host *shpnt);
static void datao_run(struct Scsi_Host *shpnt);
	static int esp_do_phase_determine(struct esp *esp);
	static int esp_do_data_finale(struct esp *esp);
	static int esp_select_complete(struct esp *esp);
	static int esp_do_status(struct esp *esp);
	static int esp_do_msgin(struct esp *esp);

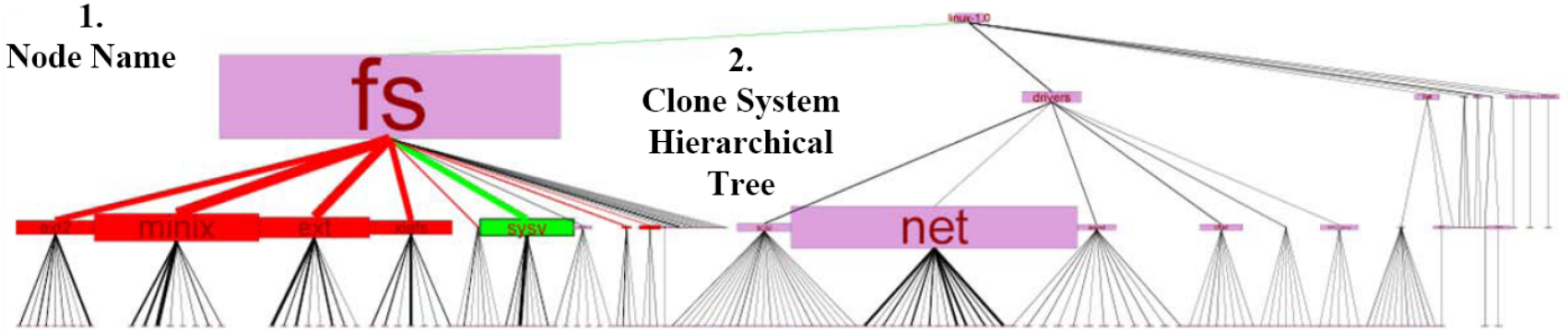
linux-2.6.16.13\drivers\scsi\ips.c: 2383-2398	linux-2.6.16.13\drivers\scsi\iscsi_tcp.c: 3466-3477

case IPS_SUBDEVICEID_4M:
ha->ad_type = IPS_ADTYPE_SERVERAID4M;
break;
 	
case IPS_SUBDEVICEID_4MX:
ha->ad_type = IPS_ADTYPE_SERVERAID4MX;
break;
 	
case IPS_SUBDEVICEID_4LX:
ha->ad_type = IPS_ADTYPE_SERVERAID4LX;
break;
 	
case IPS_SUBDEVICEID_5I2:
ha->ad_type = IPS_ADTYPE_SERVERAID5I2;
break;
	case ISCSI_PARAM_IMM_DATA_EN:
	session->imm_data_en = value;
	break;
	case ISCSI_PARAM_FIRST_BURST:
	session->first_burst = value;
	break;
	case ISCSI_PARAM_MAX_BURST:
	session->max_burst = value;
	break;
	case ISCSI_PARAM_PDU_INORDER_EN:
	session->pdu_inorder_en = value;
	break;

A Framework for Clone Mining Framework



Visualization



1.Choose A Node:

linux-1.0/fs/sysv

3.
Selection Menu

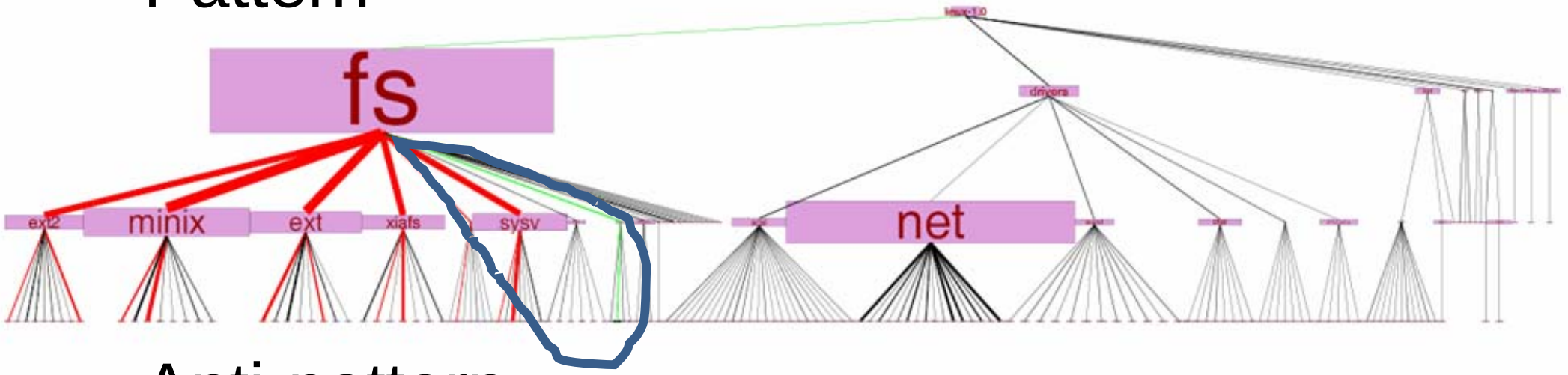
2. Clone Buddies:

```
File: linux-1.0/fs/sysv
buddies:
        linux-1.0/fs/ext
        linux-1.0/fs/nfs
        linux-1.0/fs/xiafs
        linux-1.0/fs/msdos
        linux-1.0/fs/ext2
        linux-1.0/fs/minix
        linux-1.0/fs/isofs
```

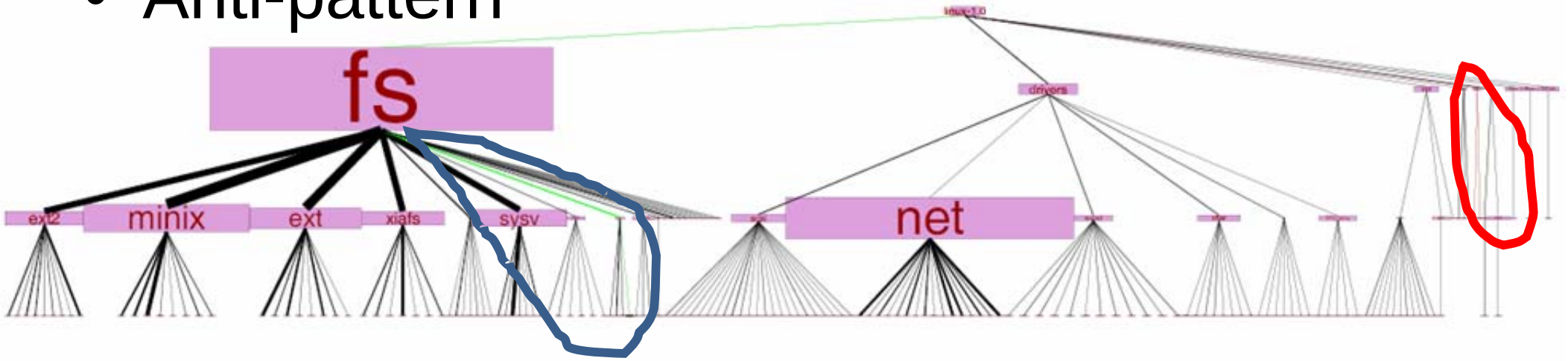
4.
Clone
Information
Panel

Interesting Results

- Pattern

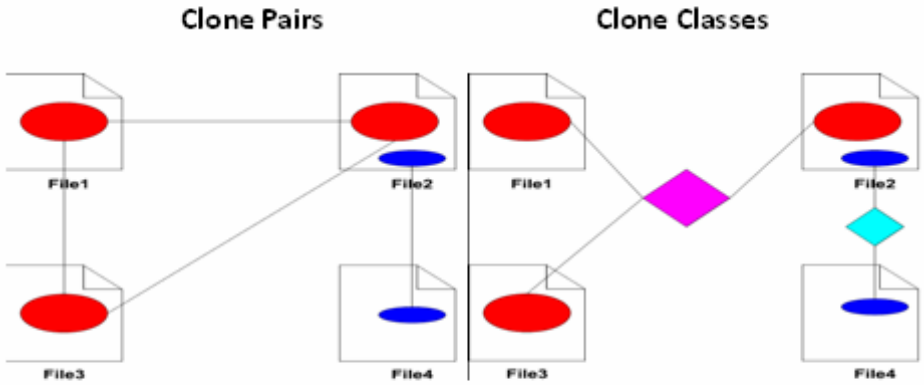


- Anti-pattern

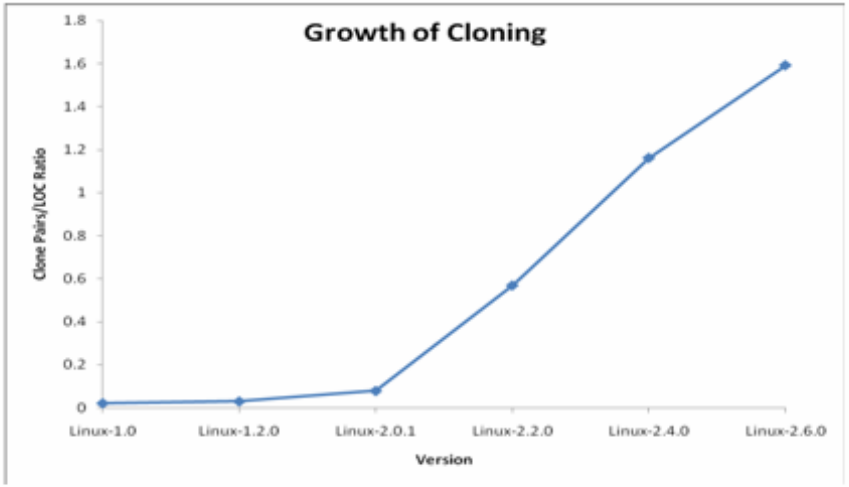


Conclusion

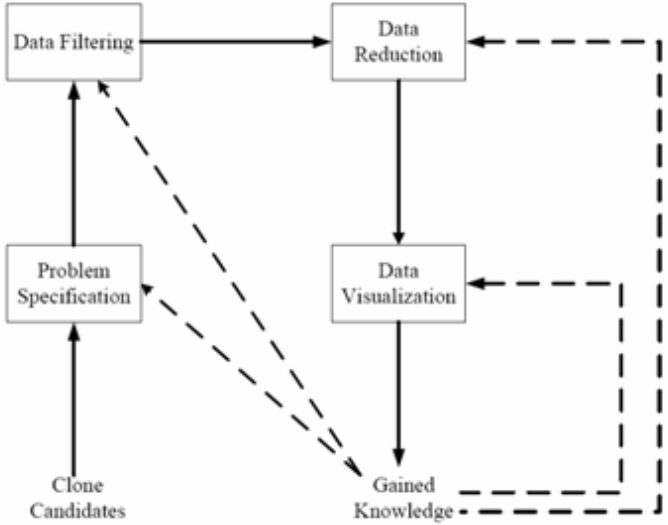
Clone Representations



Evolution of Code Clones

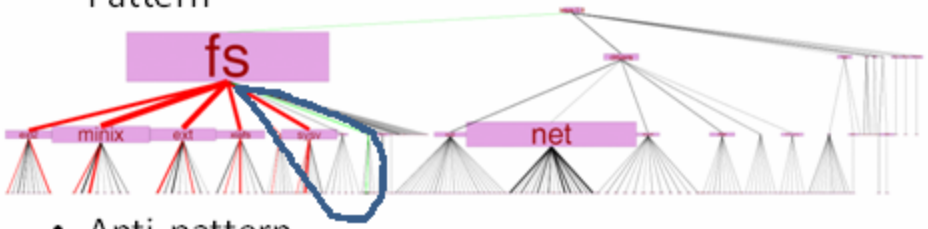


Problems With Clone Detection Output



Interesting Results

- Pattern



- Anti-pattern