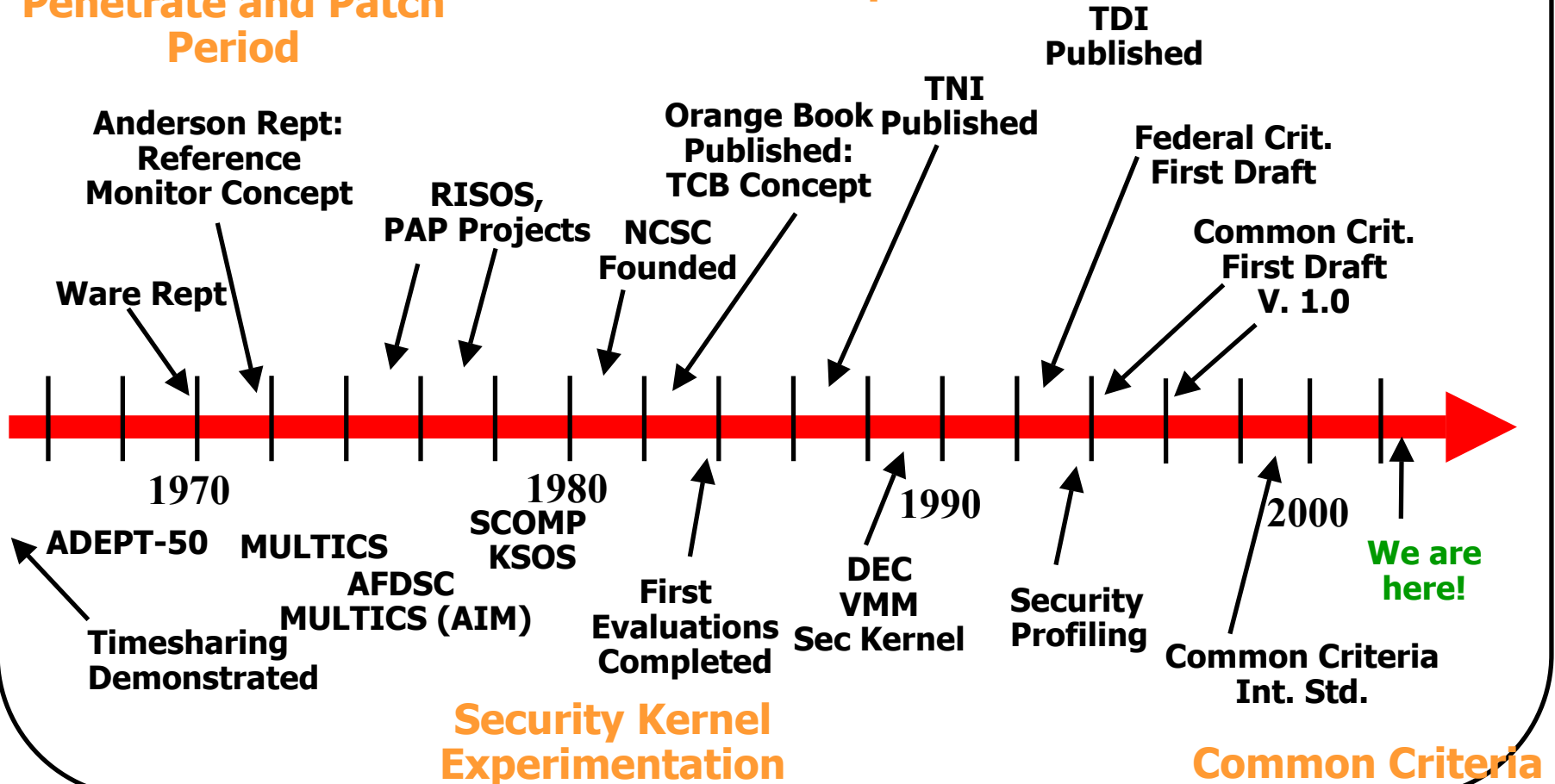


# OS security R&D and criteria development

**"Penetrate and Patch"  
Period**

**TCSEC Product  
Development**

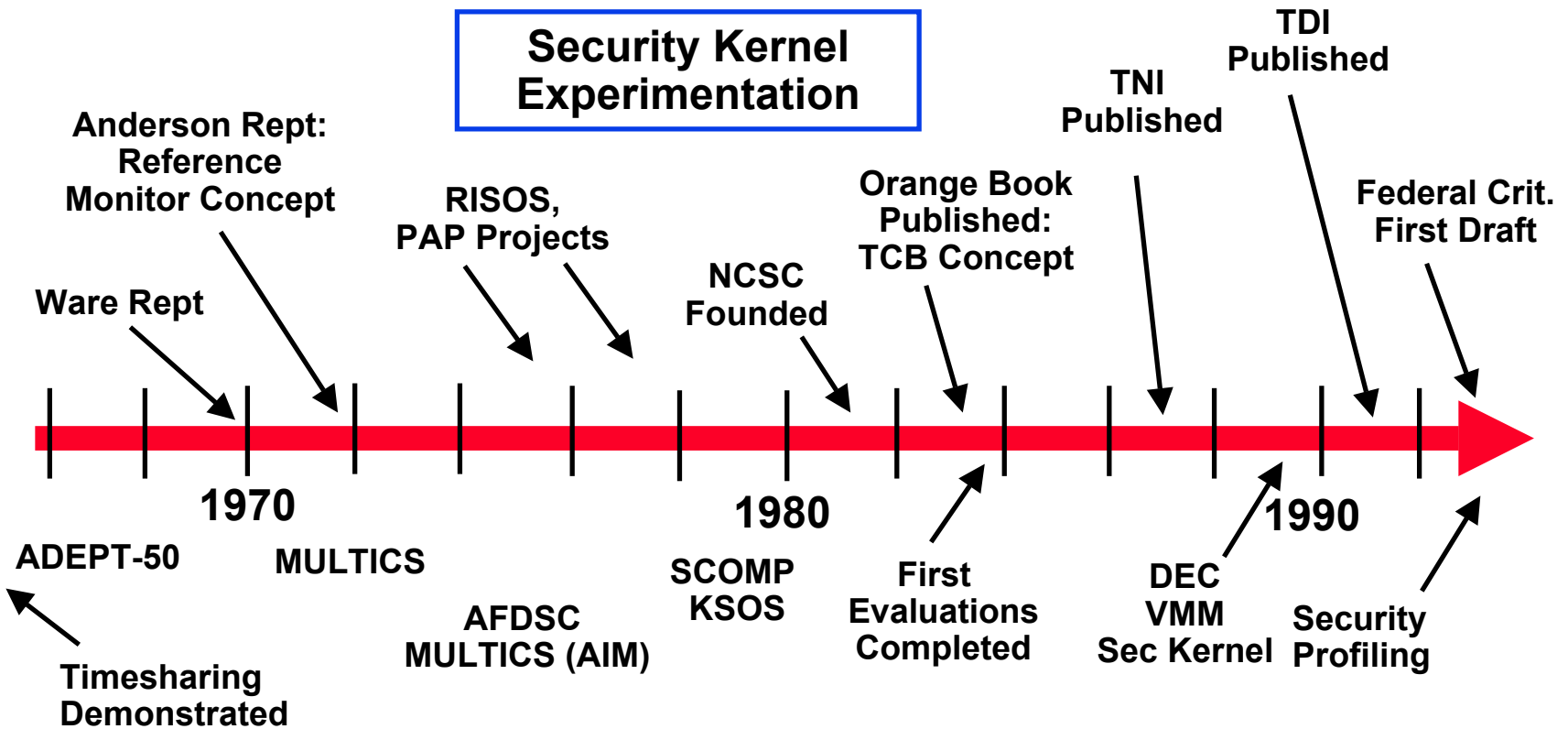


# COMPUSEC History

**“Penetrate and Patch”  
Period**

**TCSEC Product Development**

**Security Kernel  
Experimentation**



# Toward MLS Computing Service

## Dominant Architectures

Large Centralized  
Timesharing

Medium Centralized  
Timesharing plus  
Networks

Workstation - based  
Client - Server,  
LAN / WAN

## Research/Commercial Examples

### OS/Hardware

MULTICS/GE645  
TSS/IBM 360/67  
TENEX/ PDP-10+

Unix/PDP-7++  
Tandem

BSD Unix  
Sun

MS/DOS/  
IBM PC

MACH

Macintosh

### Networks

Arpanet

Ethernet

Internet



1970

1980

DEC 1990

## MLS Community Examples

OS ADEPT-50      AFDSC      PSOS      UCLA      KSOS      DSS      SAT      SKVAX      LOCK      Synergy  
MULTICS      DSU      SCOMP      Trusted      TMACH      DTMACH  
Xenix      CMW      Proto./Products

### Networks

Multinet Gateway  
Boeing LAN  
Verdix LAN

### Database

Woods  
Hole Study

SDDS SINTRA  
SeaViews  
LDV

# An Incomplete History

## Programming Methodology

Dijkstra  
T.H.E. 68

Parnas  
Info. Hiding  
72

Struct. Pgming -  
DD&H - 72

Dijkstra  
Disc. of  
Prog -76

Hoare  
CSP 78 - 85

Gries  
Sci. of Prog  
81

Sufrin Z Raise  
84 85

Knuth  
Literate Prog.  
86

Balzac  
91

SRI: SPECIAL- HDM 76/ EHDM 83 / PVS 90?

## Program Verification

Floyd  
67

Hoare  
69

IPV-  
PARC  
73

UT / CLINC:  
GVE 74 / ROSE 88

SDC/Burroughs/Unisys:  
Ina-Jo / FDM

IP Sharp ORA-Canada:  
mEVES-mVerdi 83  
EVES -Verdi 87

## Automated Theorem Proving

Bledsoe

Boyer-  
Moore 71

London

SDVS 77  
LCF 77

Larch 80

ORA-US:  
Romulus (Ulysses)84?  
Penelope86/CLIO

HOL 85

1970

1980

1990

## Security Modeling & Theory

HWM-  
ADEPT-50

Ware  
Rept

Walter  
et al  
Bell-  
LaPadula

Feiertag  
B-L / KSOS

Goguen.-  
Meseguer  
Non-  
Interference

Clark  
Wilson

McCullough  
Restrictiveness  
McCullough  
Hook-up

Anderson  
Rept -  
Ref Monitor

Denning  
Lattice

Sutherland  
McLean  
System Z

Gray  
Probabilistic  
N-I

NRL Center for High Assurance Computer Systems

# Towards Secure DBMS

## Research

Codd

Hinke-Schaefer

Woods  
Hole Study  
- integrity lock  
- replication  
- view-based sec.

Integ.Lock Proto.

SeaViews

LDV

SD-DBMS

SWORD

SINTRA

MUSET

## Commercial

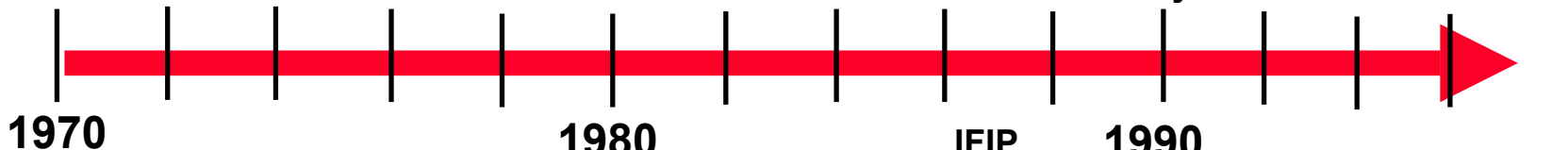
TRUDATA/SQLSentry

T-Rubix

T-Oracle 7

Informix OLS

Sybase S-SQL



1970

1980

IFIP  
WG11.3

1990

Ware Rept

Anderson Rept:  
Ref. Monitor

NCSC

TCSEC:  
TCB Concept

TNI

TDI

First TDI  
Eval. Done

## Dominant Architectures

Large Centralized  
Timesharing

Medium Centralized  
Timesharing plus  
Networks

Workstation - based  
Client - Server,  
LAN / WAN

## Network Technology

Arpanet

Ethernet

Internet

World  
Wide  
Web

*NRL Center for High Assurance Computer Systems*